CATECHISM OF MUSICAL HISTORY

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CATECHISM

OF

MUSICAL HISTORY

BY

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PART I.

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PART I.

HISTORY OF MUSICAL INSTRUMENTS AND HISTORY OF TONE-SYSTEMS AND NOTATION.

CONTENTS

The Second Part contains the History of Musical Forms, with Biographical Notices of the most illustrious composers

INTRODUCTION.

FIRST CHAPTER.

GENERAL REVIEW.

1. How old is music?

That nobody knows. As far back as literature and the monuments of architecture and sculpture reach, proofs are found that the musical art was practised. Egyptian sculpture bore images of harps, flutes and other musical instruments as early as 3000 to 4000 B.C.; and it is said that in China, by command of the emperor Hoang-Ty, between 2000 and 3000 B.C., Ling Lun undertook the theoretical foundation of the scales. In India also, as the *vedas* (sacred books) prove, musical culture dates from antiquity.

2. Have any musical monuments, i.e. melodies of those ancient times been preserved?

No; we have information only as to musical instruments and the modes or scales (of rather later times) which formed the foundation of the melodies.

3. Was not singing also practised in those ancient times?

Certainly; it is even widely assumed that vocal music is older than instrumental, at least if by the latter we are to understand the production of melodies instrumentally.

4. What might we otherwise understand by it?

That kind of music which as regards tone is only a confused noise (though it maintains a regular rhythm), which was not only used in ancient times, especially as an accompaniment to dances, but is still used by some simple

peoples whose musical cultivation is otherwise very undeveloped.

5. How old are the oldest melodies that have been preserved?

There are none which extend beyond the birth of Christ — at least not in the notation as preserved to us. But many Hebrew Temple songs, many psalm tunes taken by the Catholic church from the Hebrews, and similarly perhaps, hymns which the Christian church has appropriated from some heathen *culte*, may have preserved, more or less faithfully, some considerably older melodies.

6. Then the history of music would accordingly date only from the birth of Christ?

No; because then we should be leaving out of consideration a period which, though none of its melodies have been preserved, has furnished us with a number of theoretical works of a nature to awake a very high opinion of the musical art of that time. It was the time when Greece had reached the summit of its fame; all the music of the middle ages has its root in that time, and the musical theory of the Greeks is still the abiding foundation of the scientific treatment of our art.

7. Is the difference between the music of the time from which we derive the oldest monuments and the music of our time one that must be considered greater than the difference between the poetry of our time and of that, or between the sculpture and architectural monuments of the two epochs?

Certainly; for while we are justified in the opinion that in antiquity the arts named had attained the full development of every means by which they might be expressed, so that for the sculptor and architect the study of the antique is indispensable — his upper school in fact, the same cannot be maintained with regard to music. It is, at the least, certain that the music of the Ancients knew nothing of the polyphony peculiar to the music of the present day. Perhaps its rhythm and melody were highly developed both in regard to variety and delicacy; but the grand effects produced by the combination of several independent melodies — the power of harmony, it did not know.

8. At what time did this polyphony first appear?

After the migration of nations, and the decline of

Grecian and Roman culture, when the peoples of North-Western Europe became the bearers of a new period of culture — in the middle ages.

9. Did this polyphonic music develop at once, in such perfection as to make the study of the monuments of that time the duty of musicians now?

No: the combination of several parts, of several independent melodies, had first to free itself by a struggle of centuries from a stiffness and helplessness, which can have only an historical interest for musicians at present, and possesses no essential importance in schooling them in the *technique* of their art.

10. How far must the musician, then, go back if he wish to study the masterpieces of the past, and by such study enlarge and enrich his own knowledge and ability?

To about the 14th century, certainly to the 15th. The 16th century shows music to have attained an astonishing height in artistic *technique* and effect: the works of that time have vitality still, and to study them is in the highest degree instructive and helpful to the composer.

11. Is there any difference between the music of this early period and the music of our own time which forbids the musician's adopting the style of that time solely?

Yes, and no. A work of the 16th century could certainly not be taken for one of the 18th or 19th; and were a composer to write now in perfect conformity to the style of the 16th century, he would have to struggle against his nature in more ways than one, and would not win unconditional approval. But he may feel certain of great results, and his efforts will lead onward, not backward, if, in mastering the points of difference between the manner of writing of the former time and our own, he blend as much as possible the peculiarities of the styles of both epochs.

12. But what distinguishes the polyphonic manner of writing of the present time from that of the 16th century?

The music of the present time does not treat all the parts of a polyphonic composition as equally powerful and important, but one part always (or nearly always) appears as the principal part — as the melody, while the others occupy subordinate positions as accompanying parts. In the music of the 16th century, every part is a melody, and its harmony is simply the result of the combination

of several melodies, whereas now the harmony of the accompanying parts serves principally to enhance the effect of the principal part.

13. Are not many masterpieces of the time of the development of polyphony (up to the 16th century) based upon some given part, upon some given melody from the Gregorian chant, or upon some popular air, so that the latter must be regarded as the principal part and the other parts as its accompaniment?

Yes, for the composer of the work, but not for the hearer. For real musical life by no means disclosed itself in the so called *cantus firmus*, which mostly consisted of notes of very long value, while the added parts received lively ornamental melodies. This so-called principal part, mostly the tenor, was thus almost lost sight of amidst the lively countermovement of the other parts, by which it was overpowered.

14. At what time then were the principles of the new style first introduced, which placed one part, as the melody, in the foreground, and reduced the others to the rank of accompanying parts?

About the same time that strict polyphony reached its highest state of perfection, that is, at the end of the 15th, and beginning of the 16th century; at least about this time great favour was shown to a method of composition, in which an essential peculiarity of the former style, namely, the imitation of the movement of one voice by that of the others (after the manner of a fugue) was abandoned, with its consequent variety of rhythms and the alternate rest and re-entry of the single voices. Now all the parts moved harmoniously on together, and it naturally followed that the highest part appeared the most prominent, and was therefore worked out with special care. It was in popular airs, and in the Protestant chorales founded on them, that this manner of writing first took definite shape; but it soon made its way into the highest forms of art, thereby maturing a style in which the older method of composition reappeared, transfigured by the new principles (style of Palestrina).

15. Then the third chief period would accordingly date from the Reformation, or from Palestrina?

No; the melody was still bound in its moving with the other parts. It had still to emancipate itself to perfect

freedom, to come forward as the undisputed and indisputable autocrat, and reduce the remaining parts to the subordinate position of servants. It was necessary that the equal importance of the parts should be consciously denied; and the new era in musical history only dates from the day when this occurred.

16. How, when and where was the idea hit upon?

After the highest part of a polyphonic vocal piece (the artistic music of the middle ages was exclusively vocal) had come to be regarded as the melody, it was not long before a sort of arrangement for home was made, the highest part in which was sung, and the lower parts played as well as might be on a lute, harpsichord or some other instrument capable of harmony (gamba, organ). This practice matured in the 16th century, attaining general acceptance, so that new vocal works appeared simultaneously as lute and instrumental (harpsichord) arrangements. In Italy, at the end of the 16th century, from a similar cause (to support and partly replace the vocal parts — not the melody, of course) thorough-bass was introduced for the organ and clavicembalo. But the conscious denial of the equal importance of the parts, the recognition of the melody as the bearer of the musical idea, only followed in 1600, at Florence, on the part of a society of learned men, partly art patrons and partly musicians, who aimed at nothing less than the revival of the wondrous effects of antique Grecian music, recorded by ancient writers. These *savants* understood enough of the accounts of the Ancients to be aware that the latter sang, not in parts, but in unison; but that they were opening a new epoch in art when they gave an instrumental accompaniment to solo singing, they never suspected. They were the creators of the opera, of the oratorio, and therewith of all modern music.

17. But if, as appears from the foregoing, instrumental music properly so called also dates only from the beginning of the 17th century, would it not be more correct and distinctive, to mark the new epoch as that of instrumental music?

No; for, in the first place, they already had polyphonic music produced by instruments only, even in the 15th and 16th centuries, although the pieces played, whether dances or other compositions, were really written for the

voice (for 4 voices mostly); and besides, the instrumental music introduced after the 16th century, was by no means distinguished first of all in style, from the vocal music with instrumental accompaniment of which we were just speaking. What was essentially new, was far more the evident concentration of the musical contents in one part, which the accompanying parts only supported so far as was required for a clear setting forth of the harmony.

18. Did the strict polyphonic style entirely disappear immediately after the introduction of the new accompanied style?

No; and it has not disappeared now, nor must it ever disappear, but rather, as we remarked, the highest duty of our time is to mingle the characteristics of the former style with those of the present one as far as this is possible. As brilliant examples of the way in which this may be done, let the young artist call to mind two great masters, who, though born amidst the traditions of the old method of writing, yet fully understood the new, and created works which will remain imperishable models for all ages, equally imposing from the power of the melody and the clearness of the harmony on the one hand, and from the richness and completeness in the management of the single parts, on the other hand. While Palestrina's music seems to us to be the close of a more remote epoch in art, on which the dawn of a new age casts its rays, Bach and Handel equally show us centuries beforehand how a future epoch will assimilate the polyphonic style to the accompanied. Through them the new style raised its first gigantic domes on which the old one, like a sunken sun, poured its rays of purple and gold. For a time the two styles remained abreast, there the old one in all its antiquated pedantry, here the new one, at first but the shadowy meagre production of thought, yet soon becoming stronger and stronger until finally the two mingle and amalgamate in the most varied proportions. The new style had first to develop in all its purity to perfect vigour, as happened in Italian opera of the last century and of the beginning of this, in the instrumental style of Haydn and Mozart, and partly in that of Beethoven also, before the fact could be recognized that the salvation of art lay not in it alone, and that everything in the style of the 14th to the 16th century did not belong

to the lumber room. The study of Bach and Handel showed the way back to the study of Palestrina and that of his contemporaries and predecessors.

19. Which are, therefore, the three chief periods in the complete history of music?

I. Period — Antiquity. The period of absolute homophony (vocal and instrumental) extending to the 10th century, A. D.

II. Period — Middle ages. The period of absolute polyphony (artistic music exclusively vocal) extending to the end of the 16th century.

III. Period. Modern time. The period of *accompanied melody* (harmony, vocal and instrumental) taking root in the 15th and 16th centuries and reaching to the present time.

The presumable style of the future, which the present already strives for, would be — that of *polyphonic accompaniment.*

BOOK I.

HISTORY OF INSTRUMENTS.

SECOND CHAPTER.

THE INSTRUMENTS OF ANTIQUITY.

20. Which are the oldest instruments?

That is hard to say. Without doubt, the oldest artistic instrument is, as is natural, the one bestowed on man by nature — the voice. But it is still a question whether song worthy the name is older than the rude music of percussion instruments, of which again the one given man by nature — the hands, plays the first part with uncivilized nations in the accompaniment of dances, as it did also with the nations of remote antiquity.

21. Which class of musical instruments had the earliest representatives among the nations of antiquity?

As far back as historical research extends, instruments

of all kinds are found together: percussion, wind and stringed instruments.

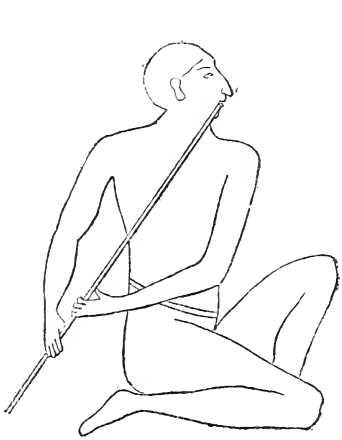
22. Why this order instead of the one usually adhered to?

Because percussion instruments are the most primitive, and as regards the majority, the rudest, and were therefore probably the first invented; whereas the stringed instruments, even more than the wind instruments, presuppose a finer perception of tone.

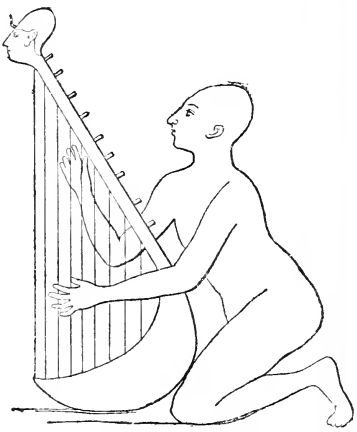
23. Let us begin with the Egyptians, so well known to have been the most ancient of cultivated nations. Had they stringed instruments in the remotest time known to us?

Certainly; sepulchral paintings dating from the period of the fourth Egyptian dynasty, which flourished between 4000 B.C. and 3000 B.C., show images of harps and lutes, that is, of the two principal classes of stringed instruments, the strings of which are played by plucking them.

24. How are instruments of the harp family distinguished from lutes?



Ancient Egyptian Flute (Sebi).

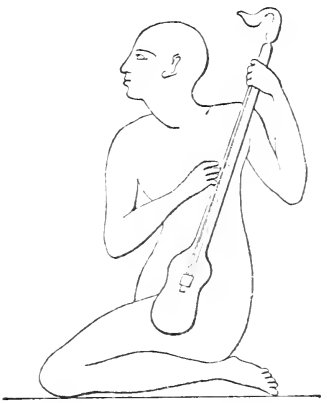


Ancient Egyptian Harp (Tebuni).

Instruments of the harp family are strung with a greater number of strings, each of which can produce only a single tone; instruments of the lute kind need fewer

strings, as they are provided with a fingerboard and strings that can be shortened at will, so that a considerable number of different notes are obtainable.

25. Did these antique harps and lutes resemble the harps of our time, or the lutes of the 17th century and their last present descendant, the mandoline?



Ancient Egyptian Lute (Nabla).

For the most part, yes. But, at first, harps were strung with but few strings, and besides, had no soundboard; very soon, however, they developed into a very near approach to their present form, with many strings, a properly constructed sound-box, pegs for holding the strings, and a cross-bar. They were of considerable size (above a man's height) and in playing them the performer either stood or kneeled. Their Egyptian name was *tebuni*. The lutes, called *nabla*, had all the essential elements of the present mandoline, namely a convex sound-box, a long neck (with finger-board and pegs), a bridge, sound-hole and 1 to 3 strings.

26. What is the object of the sound-box? — Do the strings not transfer their vibrations direct to the air?

No. That would only give a poor thin sound. Even the oldest of Egyptian harps, which still had the shape of a bow — which, from the fact of its string sounding on the discharge of an arrow, doubtless led, as tradition relates, to the invention of instruments of this kind — could hardly have dispensed with a soundboard to strengthen the sound; but this was perhaps supplied by the *podium* on which the player sat. The vibrating string first imparts its vibrations to the soundboard, and the latter then transmits them from its entire surface to the air.

27. Had the Egyptians any other stringed instruments?

In later times, they received the lyre from the Semites

(Aamu or Hiksos) or Assyrians, but antiquity knew nothing of this instrument.

28. With what wind instruments was the ancient Egyptian acquainted?

With various kinds of flutes, and also with simple instruments with cup-shaped mouthpieces. Their flutes were for the most part straight, with beak-shaped mouthpieces, like the now disappearing flageolet, and all the flue-pipes of the organ; they had but few soundholes, and consequently a limited compass. They were called *mem*. With these we also notice cross-flutes, played at the side like our own now; they were called *sebi*. The double flutes often met with were probably two *mem* played together; still the assumption is not excluded, that certain strikingly thin wind instruments (made of oat or barley stalks) were such as we must class under reed instruments. Later, we meet with bent flutes, which probably came originally from Asia; the bending was for the purpose of maintaining the possibility of manipulation in spite of increased length (as keys were unknown in that remote age).

29. Were the first instruments with cup-shaped mouthpieces, above mentioned, wound round like horns and trumpets are now?

No; this art was not acquired until much later. They were straight and also quite short.

30. Had the Egyptians percussion instruments?

They had military drums in the form of small barrels, covered at both ends with tightly stretched skin, and struck on both ends with the hands or with a drumstick. Besides these, they had tambourine-like hand kettle-drums, and a variety of wooden rattles, to which the *sistrum* also belonged that played a part in the worship of Isis.

31. Did the ancient Egyptians use these numerous kinds of instruments singly only, or did they combine them in a sort of orchestra?

From pictorial representations we should conclude the latter. But ensemble playing, when not used merely to mark the rhythm (by hand-drums and rattles), may have been limited to playing in unison or in octaves. If the Egyptians knew regular polyphony, it must appear incomprehensible that the Greeks did not acquire it from them.

32. Did the Egyptians hold music and musicians in esteem?

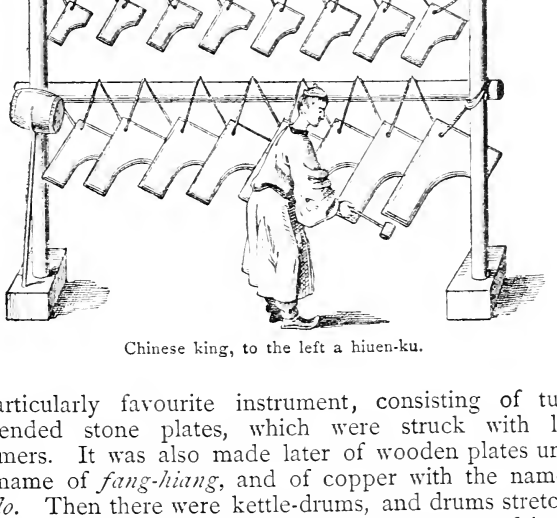
Yes. "Music accompanied the sacrifice, the dance, lamentation for the dead, and the festive meal. Inscriptions show us that there were musicians of distinguished position at court. The leaders of song were illustrious persons belonging to the king's elect." (Ambros.)

33. Is the musical theory of the Egyptians preserved?

No. And yet Pythagoras, who was educated in Egypt, probably acquired a knowledge of the mathematical foundation of the theory of intervals from the Egyptian priests.

34. Let us turn to the second cultivated nation of antiquity — the Chinese. Had they also, stringed, wind and percussion instruments of old, like the Egyptians?

Yes; but with them the percussion instruments were the most richly developed. First of all, there is the *king*,



Chinese king, to the left a hiuen-ku.

a particularly favourite instrument, consisting of tuned suspended stone plates, which were struck with little hammers. It was also made later of wooden plates under the name of *fang-hiang*, and of copper with the name of *yün-lo*. Then there were kettle-drums, and drums stretched with skins of animals (hiuen-ku) and all sorts of instruments for making a noise, rattling and striking. Standing

a degree higher, there were bells of the most varied dimensions, made of a mixture of copper and tin. There were also complete sets of bells, played in the same way as the *king*.

35. Did the Chinese also know the flute in those ancient times?

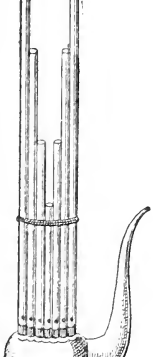
Certainly; in as many as three forms, viz. the straight flute (*yo*), the cross-flute (*tsche*, with the blow-hole in the middle of the instrument), and a collection of bamboo reeds of different length, fastened side by side and blown into as one blows into hollow keys (*siao*, similar to the Pandean Pipe of the Greeks).

36. Which of the three kinds was probably the oldest?

Probably the last named, as it had neither finger-holes (not even requiring such primitive fingering as the *tsche* with its three sound-holes right and left of the blow-hole), nor yet an artistic method of forcing the wind against the edge of a sound-hole, as was always the case in the *yo* (with its 3, later 6 finger-holes).

37. Had the Chinese other wind instruments?

Yes; but these mostly belong to a later period. They had trumpet-like brass wind instruments (with cup-shaped mouth-pieces), but they were not curved, but straight, or at most insignificantly bent; also a kind of oboe, that is, a wind instrument with a reed *(koan)*, and also a rather complicated instrument, with beating reeds, viz. the *tscheng*.



Chinese Tscheng.

38. Did the Chinese get their knowledge of this instrument from the West?

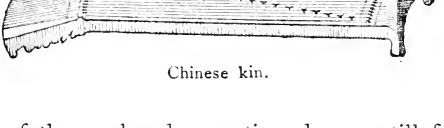
No; on the contrary, when the Chinese instrument became known in the West, it developed there into the harmonium.

39. Is the tscheng outwardly similar to the harmonium?

No; the body is a hollowed pumpkin which is blown into through an *S*-shaped pipe. Within it are fixed 12 or 24 bamboo reeds, closed by metal plates with beating reeds. The admission of the wind to each single reed is effected by closing the finger-holes.

40. Had the Chinese stringed instruments?

Originally they had only two cither-like instruments, which had flat sound-boxes without fingerboards, over which were strung rather a large number (25) of strings of twisted silk — the *kin* and *tsche*. These instruments,



Chinese kin.

like most of those already mentioned, are still favourites. It was only later, through the Persians and Hindoos, that the Chinese became acquainted with lutes, which, as is known, existed in Egypt in antiquity.

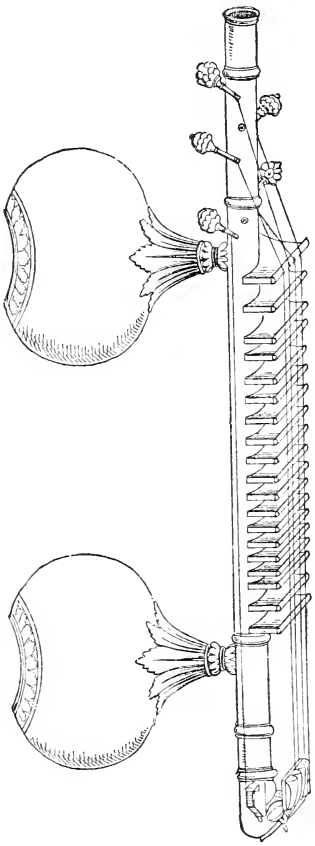
41. The Hindoos also, as we know, cultivated music in very ancient times. Is there anything particular to remark in regard to their musical instruments?

The Hindoos had numerous percussion instruments of the kettle-drum and trumpet kind, rattles, trumpet and trombone-like wind instruments, also flutes(*basarce*, played with the nose) and very remarkable stringed instruments.

42. Why so remarkable?

Inasmuch as the simplest kind of stringed instruments, those of the harp and cither family, in which each string could only give a single note, seems to have had no representatives, while several kinds of stringed instruments with fingerboards, were in existence. The oldest and most remarkable of these was the *vina*, which consisted of two hollowed pumpkins supporting a wooden tube nearly 4ft. in length, on which were glued 19 bridges of graduated height. At one end was a tail piece bending upwards, from which 7 metal strings ran across the bridges (touching only the farthest and highest one) to the pegs at the other end. So the 18 smaller bridges formed a fretted fingerboard, that is, the player produced higher or lower notes according as the bridges on which he pressed the strings down were nearer to or further from the tail-piece. The strings were plucked with a metal-pointed thimble. The *vina* has not been accepted by other nations. An instrument of

the lute family, the *magoudi*, was probably obtained by the Hindoos from the Arabians, who had obtained it from the Egyptians. The age and descent of the *ravanastron* (also called *serinda*), has not been fully determined; were we to find certain proofs of its great antiquity, we should be compelled to recognize in it the oldest form of a bowed instrument. The assumption, however, is only too well founded that this instrument likewise — and at a later period even — was made over to the Hindoos by the Arabians.

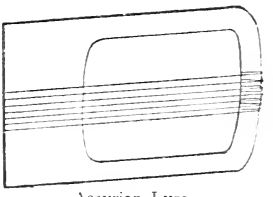


Indian Vina.

43. What do we know about the musical instruments of the Assyrians and Babylonians?

Very little about either; nevertheless it seems certain that the musical art had not been developed to any degree worth mentioning either in Nineveh or Babylon; although it may have played an important part in war time to animate the troops, and in times of peace at the voluptuous feast and brilliant festival. Among Assyrian instruments must be included those of the harp and cither kind, which lay horizontally and were played with a plectrum. A Babylonian instrument known only by name, the *sabbeka* or *sambuka*, might be identical therewith, since the name was preserved in the West for similar instruments, far into the middle ages (with the Greeks *sambyke*, Latin

sambuca, middle-age high German *sambiut*, equivalent to *psalter*, Eng. *psaltery*). The lyra also was originally an Assyrian instrument, which had under its strings, running parallel to them, a soundboard with a square piece cut out of the upper part of it, so as to leave a rounded frame at the top, as in the Celtic *chrotta*. The lyra was held under the arm, and played with a plectrum. An old Babylonian instrument, the *symphonia* (sumphoneia) was destined later, after repeated improvements, to give rise to the organ. It was a set of bag-pipes of the most primitive construction — a leather wind-bag which was blown into through a pipe, and had the bowl of a pipe standing out from it on the opposite side; this bowl doubtless contained a reed and, of course, several finger-holes. Besides these, both the Assyrians and Babylonians had kettle-drums, drums, flutes and straight trumpets.



Assyrian Lyra.

44. Did the Hebrews cultivate music to any extent worth mentioning?

Certainly; they esteemed the musical art very highly and gave it an important part in the Divine service. Probably the music of the Hebrews, as well as their instruments, is to be traced to Egypt. They may have obtained the harp on their round-about journey through Phoenicia, as the Phoenician name for the instrument (*kinnor*) seems to indicate. Moreover, the Hebrew harps were smaller than the Egyptian, and triangular. Other Hebrew stringed instruments were, the *nebel* (psaltery), which was square and had a soundboard under the strings (like the Babylonian *sambuka*), the lyra also, was known to the Hebrews and indeed in very perfect form (*hasur*), with a tortoise-shell-shaped sound-box, free upright arms, and cross-bar for holding the strings, instead of the primitive frame of the Assyrian lyra. As for the rest, fancy has imaged marvellous things about the musical instruments of the Hebrews, but it is not much we know about them. Attempts have been made to prove, and from the Talmudical writings even, that they had bowed instruments, which, certainly, they never possessed. If the Hebrews

had instruments with necks and three strings *(schalischim)*, these, without any doubt, were lutes, which they had become acquainted with in Egypt.

45. What wind and percussion instruments had the Hebrews?

Among the wind instruments, the *schofar* and *keren* were conspicuous, probably as being originally national: they were curved rams' horns used in the Temple service; no trace of them is to be found with any other ancient cultivated people. The straight trumpets *(chazozeroth)*, flutes *(nekabhim*, and a smaller kind, *chalil)* and hand kettle-drums *(toph)*, they certainly acquired from the Egyptians, and probably their cymbals *(teltselim)* and rattles *(maanim)* also.

46. Had the Hebrews a knowledge of harmony, that is, of polyphony as we understand it?

Hardly; there is as little known of them as of any ancient people on which to found such an assumption. The very full music at parades, or victorious celebrations, as well as in the Temple service was no doubt played either unisono or alternately, and the rhythm strengthened by instruments of percussion. The music of the Temple had been entrusted to the Levites from the time when king David had the Ark of the Covenant carried thither; they struck the *kinnor* and *nebel*, while the priests themselves standing before the Ark, played the *schofar* and *keren*. David, as we know, did not think it beneath him to accompany his songs of rejoicing, prayer and penitence, with the music of stringed instruments.

47. Now we come to the Greeks. Did the musical cultivation of the Greeks differ essentially and in principle from that of all other nations of antiquity?

Yes. With the Egyptians and Hebrews music held a place in the service of religion for adorning the *culte* and exalting the heart; with the people of Asia Minor, it served to enhance the pomp and luxury of the princely courts, under the direction of paid musicians; but with the Greeks, we see music, for the first time, raised to all the dignity of a free art, and counted in the estimation of the nation among its chief ideal possessions. Not that it thereby occupied a privileged place; but it stood side by side with the other arts, as of equal importance with them in cultivating the national mind and heart, and on a level

with the philosophical sciences — the completing element in the creation of that high state of culture which the little Hellenic people attained, and which we moderns still look upon with wondering admiration.

48. Was the higher stand-point of the music of the Greeks evidenced by their playing — we mean by the choice of their musical instruments?

Certainly. For the Greeks, vocal music stood first. Their epics (Iliad, Odyssey) and mythological legends were sung by rhapsodes with an instrumental accompaniment, or with an instrumental prelude, interludes, and postludes, or as recitatives; the odes of a Pindar, an Anacreon, a Sappho, were sung, and the tragedies of their most flourishing period (Æschylus, Sophocles, Euripides) were a combination of poetical art, mimetics and music, which came very near to modern musical drama.

49. Which instruments held the first place with the Greeks?

The stringed instruments, as was naturally to be expected of a people so highly cultivated, but not the largest ones possessing most capacity for fulness of tone, but rather the small instruments with a limited number of strings, and clearly of feeble tone, viz. the *lyra* and *kithara*.

50. Have we any particulars as to the construction of these two kinds of instruments?

Assuredly, both from numerous pictorial representations still extant, as well as from the descriptions of authors. The lyra, which the Greeks acquired either from the Egyptians, or directly from the Assyrians, developed into a tasteful, elegant instrument. From its tortoise-shell-shaped body, which formed the sound-box, rose two freely curved arms or pillars joined at the top by a cross-bar, whence the strings were carried over the sound-board. It appears that the kithara was only distinguished from the lyra by the different form of its sound-box, which was shallow, square and joined to the arms. When using the kithara, the player held it in reversed position against his chest; the lyra, on the contrary, he held upright under his arm, or between his knees. Both instruments were probably identical originally; the larger species were called *phorminx* and the smaller — *chelys*. The lyra (kithara) is said to have had only 4 strings originally. Terpander increased their number to 7, Pythagoras added the 8th,

Theophrastus of Pieria the 9th, Ion and Hystieus the 10th, Timotheus the 11th and Pherecrates the 12th. Finally, the instrument obtained and retained 18 strings, which were made of catgut or twisted sinew. The instrument was played with a plectrum.

51. Had not the Greeks harps and lutes like the Egyptians and Hebrews?

They had them no doubt, but never allowed them to gain either great favour or importance. In the contests, at the games of Delphi and Olympia, the lyra and kithara were the only stringed instruments admitted. The harp is mentioned under the half Phoenician name of *kinyra* (= kinnor) or that of *trigonon* (triangle). The Greeks probably obtained them by way of Phrygia. We also find the Assyrian *sambyke* (the psaltery) again, among Greek instruments. Another many-stringed instrument was the *magadis*, on which two parts could be played in octaves. The *epigonion* and *pektis* had still more strings. The instrument with the smallest number of strings — namely two, was the lute which appears under the Egyptian name *nabla*. The *pandura* was probably a three-stringed lute, as the name still exists for similar instruments. The monochord was not, properly speaking, a musical instrument, but rather an instrument for purposes of acoustical instruction, both the monochord proper with but one string and a movable bridge (the antiphone monochord), and the one with four strings tuned in unison (the paraphone monochord).

52. Were not contests between wind instrumentalists allowed at the Grecian games?

Certainly. Next to the lyra and kithara, the most popular instrument was the flute (aulos). As early as 585 B.C., Sacadas succeeded in placing flute playing on an equality with the playing of the kithara at the Pythian games. Contests with trumpets also took place. It has been widely assumed that the *aulos* was a kind of *Schalmei*, or oboe; but it appears now to be settled, that it was really a flute — and a beak-flute indeed (exactly like the diapason pipes of the organ, with only two or three finger-holes). This is shown, for instance, by the following incident: whilst Midas of Agrigentum was playing at the Pythian games, 448 B.C., it happened that the mouthpiece broke; but he continued playing without it, which would hardly have been possible on a *Schalmei*. Moreover, the fact that the

pipes of the oldest organs, which were demonstrably flute-pipes, were called *auloi*, is also a strong argument for this assumption. Flutes were made of various sizes, or there were, as we say, treble, alto, tenor and bass flutes. We also again meet with the double flute *(diaulos)* known to us from the time of the Egyptians; but whether the two (a longer and a shorter one) were played together, the lower one sounding in unison with the other as in the bag-pipes, or alternately, is not determined. But the assumption is not unreasonable, that the second gave the notes of another scale, and was therefore used for modulations. The number of sound-holes varies from 2 to 5.

53. Had the Greeks other wind instruments?

First, the very ancient *syrinx*, the Pandean pipe, met with also in China, under the name of *siao*, consisting of a series of tubes without sound-holes, of graduated length fastened together; consequently each tube could only give a single note. However, the syrinx was tuned to a diatonic scale (accounts give variously from 7 to 9 tubes), and blown like hollow keys. The syrinx was not an artistic instrument, but was used by the shepherds to enliven their rural solitude. In the second century B.C., still primitive certainly, but as the unmistakable germ of the present instrument, the organ appears, in the form of a series of pipes differently tuned, and without sound-holes, placed upon a chest, and not played by the mouth but by wind artificially produced (by pumping in, with bellows, air that was compressed and regulated by water-power). The instrument sounded as soon as the player, by opening some primitive valves, admitted the wind to each single pipe. Apart from the water — probably set aside later on account of its impracticability — the organ remained unchanged for many centuries. It was invented by the mathematician and mechanician — Ktesibios, of Alexandria. Of other wind instruments, however named, the only one that had any great importance was the metal trumpet (salpinx), first, as a herald's, or signal instrument in war and at the Olympic games, next at solemn religious processions, and, lastly, at the Olympic musical contests, which were probably mostly trials of strength (Herodoros of Megara, about 300 B.C., won ten times, and could even play two trumpets at once very loud). These trumpets were straight tubas, and came originally from Egypt, whence the

Tyrrhenians had obtained them. A similar,curved instrument was called *keras* (horn), and was probably either a bull's or a ram's horn, such as was found among the Hebrews. Another instrument, expressly called the *Egyptian chnue*, was something similar. Other military trumpets only differed in the form of the sound-bell, to which the shape of an animal's head was frequently given. The Median trumpet had a reed mouthpiece. That the Greeks used all kinds of percussion instruments and rattles, especially in the noisy orgiastic *culte* of Dionysus, need scarcely be added, nor that they had acquired these from the Egyptians.

54. So the Greeks, in spite of their highly developed art theory and practice, were not acquainted with the polyphony that seems to us so indispensable?

No. Some historians have, indeed, tried to prove the contrary from certain passages in ancient authors; but as the best writers (Aristotle, Aristoxenus, etc.) attach no special importance to the simultaneous sounding of several notes, but really speak clearly only of the succession of several notes, it is surely not to be assumed that tradition, scarcely ever doubtful elsewhere, should be in error here. Therefore when different instruments were used together, or song was accompanied instrumentally, we must assume that the combined sounds were only unisons or octaves.

55. Did the ancient Romans cultivate music to a degree deserving mention?

No. The Romans were a prosaic and practical people. Courage in war, and extraordinarily strong public feeling, were the qualities that led them on to fame and greatness; for the fine arts, they had little inclination and little talent, and perhaps least of all for the most deeply impressive of all the arts — music. The earliest use of music among the Romans (at their sacred offerings and funerals) seems to have been by the Tyrrhenians (Etruscans) that is to say, of latest Egyptian origin. Later, it lay almost entirely in the hands of Greek slaves. In the first case it was coarse and wild, consisting of war-songs accompanied on shrill-toned metal flutes or trumpets; in the latter it was weak and effeminate, and (when the good traditions of Greece's flourishing period were forgotten) stood about on a level with the music of the people of Asia Minor, Assyria and Babylon, with its erotic songs, lascivious dances, etc., at feasts, festivals, theatres and elsewhere.

That the Emperors Nero and Heliogabalus were ambitious of the fame of musical artists, is only an additional proof of the low level to which music had fallen. There is no record of the works of Roman poets having been acted with music like those of the Greeks.

56. What kinds of instruments had the Romans?

The earliest to find a place among them seems to have been the flute. The Roman *tibia* was probably identical with the Greek *aulos*; and the Roman shepherd's flute, the *fistula*, was probably an instrument corresponding to our oboe, with a reed or something of the kind. For the rest, we cannot wonder if the growing Roman empire brought to Rome, from the utmost limit of its conquests, the instruments of every Eastern nation it subdued. The Greek *kithara* and *lyra* were, naturally, early found in the foremost place (it is well known that South Italian culture is old Grecian). The *nablium*, which is also mentioned, was not the *nabla* (lute) of the Egyptians, which we find rather in the *pandura*, but the *nebel* of the Hebrews, that is, a species of cither or dulcimer (constructed, for example, like the Chinese *kin*). The military wind instruments were the deep-toned straight trumpet (tuba) for the infantry, the bent high-toned *lituus* (predecessor of the *Zinken* which survived into the 18th century) for the cavalry, and the twisted *buccina*, which was perhaps deeper-toned than the trumpet, and consequently similar to the trombone, which has inherited its name (Ger. Posaune, in German of the 16th century, Busaun).

THIRD CHAPTER.

THE INSTRUMENTS OF THE MIDDLE AGES.

57. We reckoned the period of the middle ages in the history of music to last until about 1600, or until the introduction of accompanied monody; how may we rearrange this space of time, giving special attention to the musical instruments?

The middle ages in the history of musical instruments, extend from the time when antique artistic instru-

mental music fell into disuse to the time when modern music was introduced; or, which is the same thing, it comprises the time of the introduction and development of bowed and key-board instruments. Modern times begin from about that point in history when the present method of constructing bowed instruments was invented, and the pianoforte and organ became so far developed as to be able to play a prominent part in the life of music.

58. Is not the organ an instrument that the Greeks had already invented?

The invention (in the form of a water-organ) doubtless dates from the 2nd century B.C.; but it seems to have been at first only a mechanical work of art, rarely constructed, which was very slow in gaining introduction. Even in the year 757 it was considered something remarkable when the emperor Constantine presented an organ to Pepin, king of the Franks; and the intervening centuries furnish only a few scattered remarks to prove that it either existed or was known (description of an organ belonging to the emperor Julian the Apostate 4th century, A.D.; an allusion in St. Augustine, 5th century; a description in Cassiodorus, 6th century; and some basso-relievos of the period from the 6th to the 8th centuries). In the West, however, not long after the sending of this present the organ attained great practical importance as an instrument for the schools of the cloister, during the study of the Gregorian hymns. Pope John VIII. (9th century) requested bishop Anno of Freysing to send him an organ and a skilful player as music master. Numerous manuscripts also, dating from the 10th to the 11th century, contain directions for the manufacture of similar little instruments for schools.

59. What was the nature of these organs?

They consisted of a series of 8, or at most of 15 to 22 pipes, tuned, from tenor c upwards, to the C major scale. These pipes, which were of exactly similar construction with the organ pipes now termed *diapason*, stood upon a common wind-chest. In front was a kind of manual with little keys, at first placed upright but afterwards laid horizontally, which when pushed back or pressed down, gave the wind access to the pipes. The wind was pumped in by bellows, without being regulated

by water-pressure. About the year 980 A.D. there was, at Winchester, an organ (described in verse by St. Wolstan) which had two manuals (for two players), each manual having 20 keys (G to c^2 with $b\flat$ and $b'\flat$), and each key 10 pipes which always sounded together (they were probably tuned in octaves of different pitch, or perhaps with fifths like modern mixture stops); in all, therefore, there were 400 pipes and 26 small bellows. On the keys of these oldest organs the names of the notes were marked in letters.

60. Were there not at that time already organs with several registers?

No. Not before the 12th century, certainly. There were not even any organs with reeds then. As one always opened only one valve at a time, those organs were very easy to play. The division of the pipes into registers, which enabled the player to make any number of the pipes belonging to a particular key speak that he liked, may have taken place in the 12th century. The reed-stops were not added until the 15th century. The division of the pipes into registers rendered the mechanism of the instrument very complicated, and the art of playing it very difficult, so that the keys were struck with the fist, or forced down with the elbows. The pedals are said to have been invented in 1300 by Ludwig van Valbeke, an organist of Brabant; they were introduced into Italy (Venice), in 1445 by Bernhard, a German, organist of St. Mark's church. It is clear that these unmanageable instruments could easily produce an immense, overwhelming volume of sound, but that they were not available for a more independent and rapid style of playing. For this, still further improvements were necessary, by which to facilitate the pressing down of the keys. These appear to have been brought about during the 15th to the 16th century, for about that time, an organ style began to develop, which led directly to the summit of perfection (Bach); and now the organ becomes agile, allowing free flight to the composer's fancy.

61. Were not small chamber organs made, as well as the large church organs?

Certainly; and they were made with flue-pipes only, generally of wood for the sake of cheapness, or else with reedpipes only; the former were termed *positive* (Ital.

organo di legno, i. e. wood organ), and the latter *regal*. Although these instruments were not so common as the piano is now, they may, nevertheless, in the musician's house, have played an equally important part.

62. Had the larger organs of the middle ages several manuals to admit of the player's passing at once from one degree of loudness to another?

No. But this innovation must have been introduced towards the end of the period, probably first in Germany and the Netherlands. The famous organ in St. Mark's church, Venice, had only one manual even in 1700, and the pedal was only coupled to it (it had no pipes of its own); in Germany about this time, and even earlier, the larger organs had three manuals and independent pedals.

63. Were not the key-boards, invented in the first place for the organ, immediately extended to stringed instruments — to the harp in particular, and was not thus our present pianoforte invented?

No; the organ key-boards were originally, and for a long time continued to be, much too clumsy for any one to have thought it worth while introducing them elsewhere. The piano has, indeed, a different origin; it is derived from the old monochord of the Greek theorists.

64. But the monochord had only one or two strings, and, properly speaking, was not an instrument at all?

Quite right. And the oldest claviers also, had only a few strings, and were doubtless originally only school instruments. The monochord of the Pythagoreans had a movable bridge under each string, and the pitch of any note depended on the position the bridge occupied on a scale marked on the sound-board. But this moving of the bridge backwards and forwards must have had its disadvantages (rapid wear of the strings, bridges and sound-board); it is hardly astonishing, therefore, that the expedient was soon hit upon of giving each note of the scale a bridge of its own which could be brought under the string by means of a suitable lever. Think, for instance, of the Indian vina with its 19 bridges, which, instead of being pressed up under the strings, had these latter pressed down upon them. When these improvements in the monochord took place, is not known. Nevertheless, from the fact that a peculiar instrument of similar construction — the hurdy-gurdy, was

very extensively used in the 10th century, we may conclude that the system of bridges moved by means of a species of key-board, was discovered early in the middle-ages. But from this point it was a very important advance, to give the bridges a tongue-shaped form, which made it possible, by their means, not only to determine the length of the strings, but to make them sound also. In any case, this improvement which led to the construction of the clavichord, the oldest form of the piano proper, was no doubt also made, at latest, in the 14th century. Almost until its disappearance (at the close of the 18th century), the clavichord had fewer strings than keys, thereby openly maintaining its descent from the monochord, the name of which it was long permitted to bear as well as the new one. As the strings were always divided into two parts by metal pins (the so-called tangents) each string would invariably have given two notes at once, had not one half of it been deadened by damping. For this purpose strips of cloth were twisted round the ends of the strings on the left side of the player (the strings ran obliquely in front of him as in the old square pianos), or the vibrations were checked by touching the end of the strings with the hand. The name of clavichord was generally shortened to *clavier* or *instrument.*

65. What distinguished the clavichord from the harpsichord?

The harpsichord (Ger. Klavicimbal, It. clavicembalo, Fr. clavecin) was a still further improvement, but it was likewise invented in the 14th or 15th century. At the further ends of the levers, instead of tangents to strike the strings, there were little wooden bars with hard quills fastened to them; and these plucked the strings without dividing them. Of course, it then became necessary to have a particular string for each key, that is, the harpsichord was then what is called *bund-frei**), which was always a rarity in clavichords. Very soon the instruments increased greatly in size. The clavichord was at first

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*) "A clavichord was said in German to be *bundfrei* when it had a separate string for each note." F. Niecks' Dictionary of musical terms.

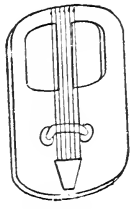
only a little box (like the old monochord) that was placed upon the table; later, as its dimensions grew in height and breadth, it was placed on feet of its own. The harpsichord was made in the form of our square pianos (with the strings running diagonally), when it was called a *spinet* (after the Venetian instrument manufacturer, John Spinetus, about 1500), or if of smaller compass, a *virginal*; or it was made larger in the form of a grand piano (the real harpsichord; Ital. also *arpicordo* or *gravicembalo*, with the strings running lengthways, as in the German Flügel, or English concert grand piano), or else like cottage pianos, or upright grands, with vertical strings (which were then strings of catgut as in the harp) and called a *clavicitherium*. In 1500, all these forms are already found, each with a compass of more than three octaves and a complete chromatic scale (7 lower keys and 5 upper keys in the octave). The mechanism of the harpsichord was naturally much more complicated than that of the clavichord, for in the first place it required a so-called *escapement*, or arrangement which should allow the lever to go back without the quill again touching the string or resting on it; and, secondly, it became necessary to have a separate damper, connected with the keyboard, for each string, and that the damper should act of itself as soon as the key was released. But this also gave an impetus to the invention of the loud pedal, which raises the dampers from all the strings as long as desired, and so allows of notes being sustained and of their sounding in sympathy. The superiority of the harpsichord over the clavichord, lay in its greater volume of tone and the possibility of sustaining the notes at will, as far as the short, rapidly decreasing tone allowed. The still fretted *(nicht bundfrei)* clavichord, on the contrary, often made it necessary to release one key before another was struck, as both used the same string. To compensate, however, the clavichord was capable of more expression in playing; a particular effect was the tremolo, a gentle trembling of the note, produced by the rapid balancing of a finger on a key (indicated by $\overbrace{\cdots\cdots}$ over the note). Although the clavier instruments of those times were very far from possessing either the fulness of tone or the capability of delicate tone-shading, which belong to ours, they had, without doubt, qualities which enabled them to play an important part in the

further development of musical art. Above all, they were capable of playing full chords (the still fretted *[nicht bundfrei]* clavichord with restrictions, of course) like the organ, to which, in spite of all their unlikeness in the character of the sound, they stood in a close degree of relationship. Towards the end of this period, therefore, they already began to play a prominent part as household instruments. The harpsichord shared partly the *rôle* of the organ, in accompanying and supporting the voice in singing, and thus prepared itself for its future duties — those of an independent accompanying and solo instrument.

66. So then, the middle ages added an entirely new family of instruments to those already known before, namely, the bowed instruments. What people invented these?

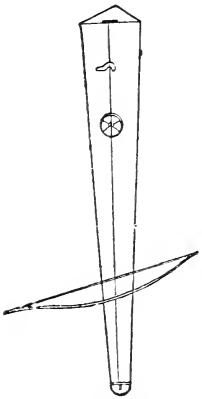
On that subject, opinions are very divided. Many hold the Arabians to have been the inventors. Fétis considers we should look for their origin to the Hindoos, which is certainly wrong. In later times, opinion has inclined to the belief that they originated in the West, because pictorial representations and descriptions of bowed instruments appear there at a time when no mention is made of such instruments in the East. In any case, the Arabs have now had for centuries, a series of bowed instruments of the most manifold variety, from the most primitive to those of comparatively highly developed construction. It is however very possible that they obtained their knowledge of such instruments during their inroads into Europe, and partially applied the new principle of tone-production to older instruments already well known to them, which until then had always been played by plucking the strings; or the instruments during manufacture may gradually have accommodated themselves to the conditions of the country. Just from the fact, for instance, that among the bowed instruments of the Arabians, there were found some with sound-boxes consisting each of half a cocoa-nut shell, covered with the stretched skin of an animal, some have thought we must needs conclude that bowed instruments must have originated in a land where nature produced these things. In any case, antiquity knew nothing of bowed instruments, and the oldest Arabico-Persian writers who make any mention of them belong to the 14th century. The chief of the old Arabian instruments was the lute

(el aud), which the Arabians acquired from the Egyptians. A smaller variety of the same, the *tanbur*, with a longer neck and a shorter sound-body, came so near to the primitive bowed instruments that one might well believe that it could easily be turned into a *kemangeh*. On the other hand, the circumstance that one of the oldest kinds of Western bowed instruments, the *gigue (giga, geige* or *lira)* had the pear-shaped sound-box characteristic of the Arabian lute, cannot prove its Arabian origin, for it is remarkable that no Arabian bowed instrument has this form. The *rebab*, also a genuine Arabian instrument like the *kemangeh*, was moreover an instrument with a foot, a square sound-box made of boards fastened together (!), and a long neck; and it was played like the cello. The Indian *serinda* might sooner claim similarity with the *gigue*; but the latter can be proved not to be of Indian origin. It is acknowledged that lute instruments were already well known before the incursions of the conquering Arabs, and therefore their transformation into bowed instruments may very well have come about without any help from the Arabs.



British Chrotta (crwth).

67. Where should we accordingly look for the origin of bowed instruments?



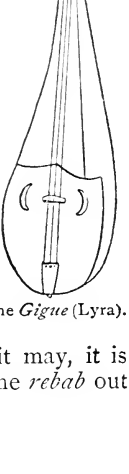
The *Trumscheit.*

Probably in Germany, France, the Netherlands and Great Britain. The last is, at all events, one of the chief starting points in the development of bowed instruments. The Welsh *crwth (crowd, crouth)*, or, in its Latinized form, the chrotta, is quite a peculiar, very old instrument, which Venantius Fortunatus, as early as about 609 A.D., specifies as British (chrotta Britanna canit). Its form resembled that of the Assyrian lyra and the Greek kithara inasmuch as it was four-cornered and had a projecting wooden frame; but it differed from these first in having a fingerboard stretching from the middle of the soundboard

up to this frame. The chrotta was originally strung with three, later with six, strings, and was played with a bow, or sometimes by plucking the strings. It is quite possible that the chrotta is the oldest bowed instrument. It is also possible that the *Trumscheit*, a peculiar instrument, probably of German origin, which lasted almost into modern times, preserved the original form of bowed instruments. It was long and narrow, consisting of three little narrow boards roughly fastened together, and strung with a single string (only exceptionally with two or even more). The bridge looked like a shoe (and was called a shoe) glued on by the sole, while the heel hung close over the soundboard. When the string vibrated, the repeated stroke of the swinging foot rendered the tone much louder, more jarring, and almost trumpet-like. Only harmonics were played on the *trumscheit*. Pictorial representations of the *trumscheit*, as well as all certain information respecting it, reach, it is true, only to the 15th century. The English used this instrument for a time as a marine signalling instrument, for which reason it was called the *marine trumpet*.

68. What do we know of the development of bowed instruments during the first centuries in which they became known?

Information before the 10th to the 12th century is very scarce, mostly only the mention of names. But sculpture and paintings representing them then grow more plentiful. Afterwards, for a long time we have to distinguish between two co-existent principal forms: bowed instruments with pear-shaped sound-boxes (i. e. with an arched body under the soundboard, as in the present mandoline), called the *lyra* or *gigue*, but in Germany and very soon everywhere — *fidel*; and those with flat sound-boxes (with the back and front joined by sides) called the *rubeba*, *ribeca*, *viella* or *viola*. There is much confusion in the use of the names. The instruments with flat sound-boxes may have been developed from the chrotta, simply by omission of the frame. The name *rebec*, Breton *rebet*, may have come from crwth. Be this, however, as it may, it is just as possible that the Arabs carried the name *rebab* out



The *Gigue* (Lyra).

of Europe, as that they introduced it here. The oldest representation of a *gigue* shows only one string; later, this number increased to four. But playing on the strings separately must have been very inconvenient as, especially when the bridge was but slightly arched, the bow could not well reach the outer strings, for want of a piece being cut out at the sides of the instrument. And this was probably the reason why these bowed instruments never essentially developed, and in the 16th century disappeared. The instruments with flat sound-boxes were at first clumsy and angular, but they were soon rounded off to a more elegant form, then little pieces were cut out of them to facilitate the movement of the bow, and the originally small number of strings was quickly increased. The rubeba, according to the description of Jerome of Moravia (13th century), had only two strings, and the viella five, two of which were, however, drones (lying next the fingerboard, like two strings of the crwth) that were only used open. All these bowed instruments were without frets, i. e., little strips of list or metal used for marking off the positions of the notes of the scale along the fingerboard, so that the player had only to touch the string above these to produce notes perfectly in tune. This peculiarity of the lute seems not to have been transferred to bowed instruments until the 14th century. That it was so transferred is also shown by the fact that the sound-hole peculiar to the lute ("the rose"), and only suited to an instrument the strings of which were plucked, also appears in bowed instruments at the same time. The older instruments always had, instead of this, two incisions (sound-holes) in the shape of two C's facing each other, one on the right and one on the left of the bridge. And it was not rare to see instruments with such incisions in the four corners. Even the lute violins, already mentioned, often show the four corner incisions surrounding the rose (though they never took the arched sound-box of the lute). No class of instruments has been subjected to such remarkable experiments and transformations as that of the bowed instruments. The side incisions became for a time so large that scarcely anything was left of the soundboard, and it resembled an X. The number of strings increased to six, and in the lute-like instruments much further still. In the 14th century, however, a fixed method of construction matured almost to

uniformity, forming a very close approach to the bowed instruments of the present day, only the gentle arching of the back and front was wanting, the lines in the outer form were almost throughout circular, the side incisions were semicircular, and the body was narrowed off to a point at the neck. The sound-holes were C-shaped and were turned either towards or away from each other. These viols gradually came to be made in four, or more sizes (as soprano, alto, tenor, bass and contrabass viols) and were always strung with six strings. But these all had frets. The bass viol is still known under the name of the *viola da gamba* (knee-viol). The last improvement in the construction of bowed instruments, which put an end to all further search and established their form so completely that it has now been servilely copied for centuries, even to the smallest particulars, was accomplished in the period from about 1480 to 1530.

69. Where did the final improvements in the bowed instruments take place?

In Upper Italy, especially at Cremona. And the reason why the masters in that part were able to supply the best instruments, is now assumed to have been, that in addition to their particular skill and excellent schools, they also had at hand a particularly suitable kind of wood (balsam pine, Ger. Balsamfichte), which was rare elsewhere. The most noted of the Cremona violin manufacturing families are, the Amati's, the Guarneri's and the Stradivari's. But the flourishing period of each of these falls within the third period of musical history. Only the eldest Amati's (Andrea, the elder Nicolo, and Antonio) worked in the 16th century. But the most famous are Nicolo Amati (1596—1684), Giuseppe Antonio Guarneri (1683 to about 1745) and Antonio Stradivari (1644 to 1737). All these made bowed instruments after the pattern of the violin which, about 1500, was developed from the old treble viola, and at first only in the soprano register, but soon in the alto (viola), bass (violoncello) and contrabass (double-bass) registers.

70. Were there not also bowed instruments with keyboards?

Certainly; and indeed very early. As early as the 10th century, a mechanical contrivance, similar to that of the keyed monochord, had been applied to bowed instru-

ments of the viol form (with shallow sound-box). But the bowing was accomplished by means of a leather-covered resined wheel, which was turned by a handle. The instrument had two strings tuned in unison, on which the keys always acted simultaneously, and with equal force; there were also two free lower-tuned drone strings, which hummed on incessantly with the others giving either a unison, fifth or octave. And even now, this instrument has not quite disappeared; it is the hurdy-gurdy. From the 10th to the 12th century it was called the *organistrum* (also *harmonia* and *symphonia*, and in France, from the 15th century, *vielle* — the former name of the viol). The hurdy-gurdy was a favourite instrument of amateurs in the 12th century, and last century it again played a prominent part at the French court, in company with the bagpipes. A similar instrument, probably constructed for a short time only, during the 15th to the 16th century, was called the keyed fiddle; it had a not very extensive keyboard for the left hand, but was otherwise treated exactly like a violin.

71. Were the instruments, which were played by twanging the strings, further developed during the middle ages?

In the earlier middle ages, mention is often made of small harps (psaltery, salteire, saltirsanch), which were either triangular or square and were held in the arm when played. A peculiar square kind was called in Germany the *Rotta*, perhaps developed from the Welsh *crwth* (chrotta) which was also occasionally played without use of the bow, as we know from pictorial representations. Notker (10th century) gives the *Rotta* 14 strings, and the same to the lira (probably that derived from the Ancients); on the other hand Hucbald speaks of a *kithara* with 6 strings tuned thus, *c d e f g a*. A larger triangular kind of harp was played by the Irish and Welsh bards; this was called *telyn* or *clearseach*, Breton *telén*. But particular importance and high development were attained by the *lute instruments*. Although the lute was known to both the Greeks and Romans, the West seems nevertheless to have acquired it from the Arabs as something new, first Spain and South Italy, whence, about the 14th century, it found its way over the whole of Europe, and gained particular favour and importance. From the 15th to the 17th century, it was the general home instrument as the piano is now. The

lute at this time had 11 strings running along the finger-board, the highest string being the melody string, while the other ten, which were arranged in pairs tuned in unison, were used in playing chords. At the end of the 16th century several more (as many as 5) drone strings were added (bass strings), which lay beside the fingerboard and were only used as open strings. A smaller species of lute was called *quinterna* (chiterna, i. e. guitar, though it was something like the mandoline in shape); but apart from the melody strings it had only four pairs of strings and no bass strings. From the 17th century the guitar was made with a flat sound-box as it is now, while the larger kinds of lute always retained the vaulted sound boxes. The constantly increasing need of lower bass notes led, during the 15th to the 16th century, to further enlargements of the lute, the first addition to it being a second peg-box for the drone strings (only played open), which was placed at the side of the first, and so the *theorbo* arose; afterwards the second peg-box was fixed to the curved neck above the first, and so the bass lute or *arch-lute* obtained; finally, the two peg-boxes were separated by a second neck several feet in length, and the *chitarrone* was produced — as tall as a man.

72. Was not a similar addition made to the number of strings in the bowed instruments?

Certainly. In fact drone strings, as we know, belonged first to bowed instruments (*chrotta*, *viella*, *organistrum*), and probably passed over shortly after to the lutes, whilst in the bowed instruments, with exception of the hurdy-gurdy, they were given up as objectless. Later, however, (probably during the period of experimenting in the construction of bowed instruments, from the 14th to the 15th century), the bowed instruments vice-versâ, took them again from the lutes. The many-stringed bowed instruments which arose thus, and were extensively used during the 16th to the 18th century, were called lyres. They were of different sizes, the arm lyre *(lira da braccio)* with 7 strings and 2 drones, the bass lyre *(lira da gamba)* with 12 strings and 2 drones, and the contrabass lyre *(archiviola da lira, lira grande* or *lirone*, or *accordo)* with strings varying in number up to 24. This family of instruments, like that of the lutes and viols (violins included) became complete towards the end of this period (in the 16th century).

73. Did this effort to develop an entire family from every type of instrument, i. e. the desire to represent the four kinds of voice (soprano, alto, tenor, bass) with the addition, even, of larger and smaller instruments, begin in ancient times, or was it an innovation?

Well, the Greeks to be sure, had flutes to correspond with the pitch of men's, women's, and children's voices, i. e. they made the *aulos* in three sizes, and the *lyra* and *kithara* may also have held a similar relation to each other with the lute and theorbo; further than this, however, such effort was foreign to antiquity. Wind instruments may well have existed throughout the middle ages in many sizes; on the other hand, stringed instruments of lower register than perhaps our viola, seem scarcely to have existed previous to the flourishing of counterpoint. In the sculpture of the 12th century first appear instruments which, like the cello, were placed between the knees because they were too large to be supported by the chin or shoulder. It is also quite natural, that the want of deeper bass instruments was first felt when, instead of rendering polyphonic compositions vocally, or as vocal accompaniments, they began to render them instrumentally. The wish of having thus one uniform *timbre*, in place of a heterogeneous combination of elements, is a good sign of the musical feeling of the time. And this led to the production also of complete choirs of wind instruments, especially of flutes, *Schalmeien*, cromornes, *Zinken* and trombones.

74. What kind of flutes had they in the middle ages?

First of all, the straight flutes (beak flutes) and cross flutes, known to us from the time of the Egyptians, that is, instruments with mouthpieces, and such as had only one blowhole. The first are, however, repeatedly met with in many varieties, viz., as real straight flutes (Fr. flute à bec or flute douce, It. flauto dolce) as *Schwegel (Schwiegel, Schwägel* also *Stamentienpfeife*, middle high German *Suegala*, Fr. *frestel* or *frestiau)* and as *Russpfeife (Ruispipe, Rauschpfeife).* The Schwegel was a kind of pipe, which tapered towards the end, had a very small compass (2 sound-holes), and was played with one hand, whilst the other beat a drum (still used in Provence, and called *galoubet*). Of the *Rauschpfeife*, all that we know is, that it was small and had only four sound-holes; but by closing the opening

either wholly or partly it could be treated as a stopped pipe, and its lower compass so increased. Presumably, the third harmonic (fifth of the octave) was then heard very loud; and the fact that an organ stop of the same name (compound stop, 3rd and 4th harmonic) still exists, makes this supposition the more probable. The cross flute seems to have been a special favourite formerly in Germany and Switzerland; for in France they called it *flute allemande*, in England *German flute*, but in Germany *Schweitzerpfeiff* (Swiss pipe). All the varieties of pipes may for a long time have been very differently made as regards size. Only the beak flutes and cross flutes developed to complete families in the 14th to the 15th century. Both of these comprised treble, alto (or tenor) and bass flutes, besides small octave flutes for doubling the treble in the higher octave.

75. What wind instruments with reed mouthpieces were known in the middle ages?

The oldest mentioned are the *Schalmeien*. Bishop Isidore of Seville (died 636 A.D.) calls the instrument *calamus* (Ger. Halm = straw). The Anglo-Norman poet Robert Wace, in his romance *Brut* (about 1115), speaks of *chalemiaux*; other forms of the name are *chalemelle* and *chalémie;* the German name *Schalmei* is of course only a phonetic rendering of the French one. In company with these, the bag-pipe is constantly met with, but under the names of *musa*, *cornamusa*, *piva*, Fr. *cornemuse*, later *musette*, and probably *symphonia* (corrupted: — chifonie, zampugna). Both were made of several sizes towards the end of the middle ages. The larger kinds of *Schalmeien* received in France the name of *bombarde*, Ital. *bombardo*, German *Bomhart (Bommert, Pommer)*, and one distinguished the usual bass bombard, the contrabass bombard (double quint bombard, It. *bombardone*), Tenor bombard or *basset-bombard* (It. *nicolo*), the alto bombard *(bombardo piccolo)*, and finally the smallest of the kind, as the Schalmei itself, which was also called by the Italian name *bombardino*. All these instruments were blown through double reeds fixed in a cup-shaped mouthpiece, and therefore not like their present descendants (oboe, bassoon), the reeds of which are immediately laid hold of by the player's lips; the larger kinds were so long that in processions etc., a special bearer, carrying the tube on his shoulder, was

required to walk in front of the player. It is well known that at Ferrara, in 1539, Canon Afranio hit upon the idea of bending the tube, over 8ft in length, of the bass bombard, and laying it together like a fagot (fagotto), by which the present bassoon was in the main invented; nevertheless the bombard still remained for a long time beside the bassoon, which from its softer tone was also called *Dolzian* (dulcian; this must not be confused with the much older names, *douzaine*, *dolcan*, which denoted the larger species of beak flutes). In the course of the 16th century, the *Schalmei*, like the bombard, seems to have been made without the cup, which added in an extraordinary degree to the instrument's capacity for expression. The name of *Schalmei* now disappeared entirely, and was replaced by the French name *hautbois* (high wood wind instrument) which all other languages adopted almost unchanged (Ger. *Hoboe*, It. *oboè*, Eng. hautboy). In place of the old kinds of alto and tenor bombards, lower varieties of the oboe developed, viz., the *oboe d'amore*, a minor third lower; and the *oboe da caccia*, a fifth lower. The latter, still further improved, is now called the English horn (Fr. *cor anglais*, It. *corno inglese*). The lower kinds of bombards found their successors in several varieties of the bassoon, viz., in the *quint* or *tenor bassoon* (now obsolete), and the *contra bassoon* pitched an octave lower. The old name *Rackett* or *Ranket* (Fr. *cervelas*), denoted the curved bombards invented by Afranio (before the omission of the cup), and is therefore merely an equivalent of the Italian *fagotto*. The French *courtaud* also belongs to the same class, and likewise the Italian *bassanelli*, made in four sizes corresponding to the four voice registers, and the German *Sordune*. All these had certain peculiarities of construction, but no details are now known of them. The large number of flaws, caused at first by bending the tube, were reduced by C. Denner, the inventer of the clarinet, in the *Stockfagott*. The bagpipes of the middle ages show further development as compared with those of antiquity (Assyrian), in so far as one or two, and even three, drone pipes (Ger. Bordunpfeifen, Fr. Bourdons) have been added to the *chanter* which issues from under the wind-bag. The largest kind, called in German the great *Bock*, had one deep drone in GG or CC, the next smaller, called *Schaperpfeif*, had two (b♭, f′), the *Hümmelchen* likewise had two (f′ c″) and the *Dudey* three

(e'♭ b'♭ e''♭). The Scotch Highland bagpipe (a military instrument even, as is well known) is supplied with wind like the antique one through a tube, one end of which the player holds in his mouth. This kind generally remained the favourite, although another was introduced with little bellows, which the player put under his arm and pressed. The bag-pipes were closely allied in character to the hurdy-gurdy, and like this again became a fashionable instrument in France during the 18th century.

76. To what class of instruments did the cromornes belong that were common in the middle ages?

Likewise to that of wind instruments with double reeds. Their chief distinction from the *Schalmeien* and bombards was in the external form, which as their name (Ger. *Krummhorn*) implies, was very curved. From the 16th to the 17th century, cromornes were made of four sizes (treble, alto, tenor and bass). These instruments did not develop further.

77. Did not the clarinet also exist in a primitive form in the middle ages?

Possibly so. It is for instance not known how old a French kind of *Schalmei* (the chalumeau, still required by Gluck several times, long after the real *Schalmei* had become an oboe) is, which had the peculiar characteristics of the clarinet — the conical sound-tube and single beating reed. The clarinet itself belongs to modern times.

78. By what instruments was the class of instruments with cup-shaped mouthpieces (without reeds) represented in the middle ages?

By *Zinken*, trumpets and trombones, to which, as allied, must also be added some primitive shepherds' instruments, first among which stands the *Alpine horn*, consisting of staves of wood fastened together, and probably very ancient. The *Zink* (It. *cornetto*, Latin *lituus*, *liticen*) consisted of a wooden tube with a mouthpiece of boxwood or ivory, and a number (5) of sound-holes. The smaller kinds of *Zinken* (It. *cornetto diritto*, *cornetto muto*, Ger. *stiller Zink* and *weisser Zink*) were straight; the larger (It. *cornetto curvo*, *cornetto storto*, *cornon*, Ger. *grosser Zink*, *krummer Zink*, *schwarzer Zink*), were curved and consisted of two pieces of wood hollowed out, glued together and covered in leather. The latter in 1590 was improved, by Canon Guillaume at Auxerre, into the *serpent*, which was supplanted by the

ophicleide, but not until a long time after; the serpent had a neck (S-shaped) and bell of brass. The *Zinken* continued in use by the town musicians *(Zinkenisten)* into the 18th century. Trumpets were for a long time made straight as in antiquity, but of metal. Vegetius Renatus Flavius (about 375) in his *Epitome institutionum rei militaris*, defines "*Tuba quae directa est appellatur*". But the trombone, on the contrary, he recognizes as a curved instrument, "*Buccina quae in semet ipsam uno circulo flectitur*". The same writer also mentions the horn *(cornu)*, which was made from the horn of a buffalo, and set in silver. The trumpet and bull's horn were and long remained natural instruments, although the trumpet soon became curved in imitation of the trombone; the trombone, however, retained the slide mechanism, and with it about the same construction it has now. In the 16th century, the trumpet was called *clarino*, *clareta* or *tromba*, in German *Trummet* and *Feldtrummet*. That the trumpet and trombone were regarded as instruments differing only in size, is seen in the Italian name *trombone*, which means a large trumpet. The trumpet is, indeed, really the treble trombone; and in the English slide trumpet, the slide mechanism for the same is still retained. The other three kinds of trombone: the alto, tenor and bass trombone, are still what they were in the 16th century. Our horn appears to have been entirely unknown in the middle ages; but it may have appeared in France towards the close of this period as the hunting horn (trompe de chasse). The early mediæval bugle horns (which Roland's *Oliphant* seems to imply were occasionally wrought in ivory) were no more artistic instruments, properly speaking, than the Alpine horn or bull's horn; like the antique shell of Charon (Triton's horn), it, in any case, gave only a few natural notes.

79. What percussion instruments were known in the middle ages?

Kettle-drums (*Heerpauken;* and, indeed, towards the end of the period with primitive apparatus for tuning), big and little drums, bells (arranged even as a *Glockenspiel*, *nolae*, *tintinnabula*, already favourites in the cloister in the 10th century; also miniature kettle-drums, called *cymbala*, were similarly arranged by the monks from the 10th to the 12th century). Also the percussion instrument still known as the *Strohfiedel*, with a scale of graduated

wooden bars on a straw base, seems to extend back into the middle ages, as S. Virdung (1511) already mentions it as the "*Stro Fidel*".

80. Did musicians in the middle ages combine the many instruments at their command, so as to form an orchestra in the present sense of the term?

No. It was not until very near the close of this period, that the charm of a mixture of different shades of *timbre* seems to have been understood; in the early middle ages, before the development of polyphony, such a thought must have been very remote; at most the idea might have occurred of letting several instruments play in unison or octaves, whilst the rhythm and sound were strengthened by means of percussion instruments, as was done in antiquity. On occasions such as public rejoicings, processions, etc., it is possible that alternate playing was more common than combined. The Troubadours and Minstrels, like the travelling musicians, nearly always played singly; but as counterpoint developed, and great polyphonic artistic works of high worth were created, instruments were first introduced to strengthen, or partly replace, the voices in singing, and then one proceeded to give entire compositions written for the voice to be performed by instruments only. But it was not a combination of different kinds of instruments that was held to be suitable for this, but only a collection of instruments belonging to the same species. And so it happened that all the favourite kinds of stringed and wind instruments were gradually made of four sizes (answering to the four registers of the voice), and that only instruments of the same family were used together (viols, from the *dessus de viole* [violin] to the *viola da gamba*, and the bigger *violone;* lutes, from the quinterna to the large bass lute; flutes of all sizes; *chalumeaux [Schalmeien]* down to the double quint bombard; cromornes of every kind; cornets *[Zinken]* down to the serpent; trumpets and trombones).

FOURTH CHAPTER.

THE INSTRUMENTS OF MODERN TIME.

81. Has modern time, that is the time since 1600, increased the stock of musical instruments?

No; for although single types of instruments (clarinet, horn, *Bügelhorn*, saxophone, *Kornett*, tuba) have been added, and others more or less improved (all the wood wind instruments, trumpets, harp, piano, organ), a large number of mediæval instruments have, on the other hand, gradually become obsolete (viols, lute-violins, lyres, lutes, *Zinken*, beak-flutes, cromornes, etc.).

82. Has modern time maintained the prominent effort of the middle ages to construct complete families of all the types of instruments?

No; of those families handed down to modern times, only very few have been preserved; for instance, only bow instruments of the violin type, trombones (with the trumpets) and *Schalmeien* (in the improved form of the oboe and bassoon), in all registers; while the flutes of deeper register have been entirely done away with, and now the only insignificant remains of the lute are the mandoline and guitar. The idea of completing the different families has only quite recently been taken up again (19th century), and new families have been created, some of which are complete (*Bügelhorns* [saxhorns], saxophone and saxtrombas), and others have at least a limited number of registers (clarinets).

83. Has our century again abandoned the plan of combining various shades of timbre and adopted that of uniting only instruments of the same timbre?

No, and yes. We have not only continued to combine a variety of shades in a full orchestra, we have gone very much further, by preserving old families and constructing new, we have created a possibility of restricting ourselves, when we need or wish, to the full harmony of instruments of the same timbre, for the performance of complete compositions or for single passages in larger works.

84. When was the clarinet added to the orchestra?

Christoph Denner of Nürnberg, who also reduced the

number of curves in the bassoon *(Stockfagott)* is said to have invented it, about 1690, or rather, by introducing the hole which facilitated overblowing in the twelfth, to have developed it out of the French *chalumeau* (cf. 77). The low register (originally the only one) retained the name of the old instrument (chalumeau), while the overblown one took that of the high solo trumpet (clarino), which it gradually replaced, the clarino leaving its name in the diminutive form to the new instrument (clarinet, meaning really small *clarino*).

85. Was the clarinet made in different keys?

Yes; higher and lower keys gradually appeared; to the clarinet in C, similar ones were added in D, E♭, F and A♭ (small clarinets) and lower ones in B, B♭ and A; in the alto register, instruments were made in F (basset-horn) and E♭, and in the bass register similar ones in B♭ and A. The bass clarinets are the newest; that in A first appears in Wagner's compositions. The contrabass clarinet constructed by A. Sax, has not become much used. The basset-horn has now again become obsolete, and the alto clarinet in E♭ has been used only in English military music. The E♭ clarinet is a chief element in military music; the still higher ones scarcely ever appear, the D clarinet solely in opera. The only clarinets now generally used in the orchestra, are those in C, B♭ and A, and the bass clarinets in B♭ and A; the favourite is the B♭ clarinet.

86. When was the horn invented?

Circular bass instruments are already mentioned by Vegetius Renatus Flavius, in the 4th century (cf. 78), under the name of *buccina*, that is, trombone. But, in history, the name and instrument ought probably rather to be kept apart, that is, there is just as much reason for tracing the development of horns to these *buccinae* as for tracing that of the trumpet to the ancient tuba. No doubt all those mediæval brass wind instruments, compared with our present ones, were of higher register and inferior length. The Egyptian and Hebrew tubas or trombones were hardly more than 4ft long; but their bores were probably large enough to enable them to produce their lowest actual note; that is, according to present ideas, considering their compass, they were not trumpets at all but cornets or signal-horns. The *buccinae* also were probably at most only of the length of the higher kinds

of trumpets. The hunting horn, as Virdung (1511) still described it, had but one curve, and therefore appears to have been short. The changes in the bore, which gave the trumpet its brilliancy, the horn its longing, suppressed tone, and the trombone its power, probably came about gradually during the course of centuries; owing to these, the use of the lowest notes became uncertain or impossible; and in order to get back the low notes, it became necessary to double the length of the tube. Perhaps also the endeavour, which we have several times mentioned, to complete the families, may have helped towards finding the most suitable length. That the antique bulls' and rams' horns and the mediæval hunting horn could have developed into the horn of our time, cannot in the least be assumed, their descendants were rather the now forgotten *Zinken*. The real horn, i. e. the horn with several curves, called the *trompe de chasse*, or *cor de chasse* (hunting horn) we find at last in the 17th century; Mersenne (1637) gives the largest kind a length of about 7 ft.; that, according to present ideas, would be a horn in high D. Count Sporck is said to have imported them into Germany towards the end of the century. The first score which introduces the *trompes de chasse* is Lully's "Princesse d'Elide" (1664). The scores of Bach and Handel make demands upon the horn, which, it is known, players of the present day are scarcely able to meet. The original chief key of the horn (as of trumpets, kettle-drums, the oboes formerly used in combination with horns, and of flutes) was D-major. But horns in E♭, F and G, and lower ones in C and B♭, early appeared as well; and at last (before the introduction of chromatic horns) there were horns in every key from high C to low A. The crook, which, it appears, was first used for the trumpet, was, in 1760, introduced in the horn by the horn player, Anton Joseph Hampel of Dresden; the same player, in 1753, discovered the stopped notes by which the gaps in the natural scale of the instrument are partly filled up. Other improvements in the horn were also made in Germany (tuning-slide, mutes). In the middle of last century therefore, the *French* horn or — as it was afterwards called in contradistinction to the chromatic instrument — the *natural* horn was constructed, and in 1765 appeared the first distinguished horn *virtuoso*, Rodolphe.

87. What brass wind instruments were used in the orchestras of last century?

Excepting horns, only *trumpets* and *trombones*. The trumpets had completely developed to their present form (with elongated curves), and were made in various keys from high A to low A. Earlier than the horns, they had crooks and also slides for correcting the pitch. It was attempted to use stopping for trumpets, the same as for horns, but owing to the bad quality of the sound, the attempt was soon given up. The slide arrangement for trumpets was given up; it was retained only in England. That the slide trumpet is only a treble trombone, is evident. The other three kinds of trombones, viz. the alto, tenor and bass trombones, retained their old construction, and remained limited to one pitch (E♭, B♭ and F, respectively). Only the bass trombone, besides being in the key of F *(Quartposaune)*, was also in that of E♭ (Quintposaune).

88. How did the present valve instruments develop from the natural instruments?

The first attempt to fill up the natural scale otherwise than by drawing in or out (trombone), was the introduction of the key mechanism of wood wind instruments or of the obsolete *Zinken*, in brass wind instruments. The beginning was made in 1770 by Kälbel of St. Petersburg, who, by introducing sound-holes covered with keys, transformed the bugle *(Signalhorn)* into a chromatic instrument. The new instrument, called the key horn — *bugle à clefs* — was first made known in France by the brothers Braun of Hanover, and is said to have been introduced into the English army by the Duke of Kent (father of Queen Victoria); hence it received the name of Kent horn (with 6 to 8 keys). Its relationship to the *Zinken*, is also shown by the ivory mouthpiece used in the Kent-horn. The bass instrument of this type, made a little later — the ophicleide (with 9 keys), received like the serpent (Bass *Zink*), an S-shaped tube below the mouthpiece. Both gave place to the valve instruments. Owing to the great lack of deep bass brass instruments at the beginning of this century (in trombones the first natural note sounds bad, while the wide-bored Bügelhorns have easy command of it), the ophicleide was much valued and made of three sizes, the highest of which, improperly called the *Altophicleide*, reached in the low notes to the

limit of the tenor trombone (in the key of F to great E, in the key of E♭ to great D); but the bass ophicleide reached, according to the key (in C, B♭, A♭,), to contra B, A and G; the contrabass or monster ophicleide, however, reached even to contra E (in F) or D (in E♭). Each of the three comprised a compass of about three octaves chromatically. The superiority of all these instruments, lay in their agility in melodic progressions of every kind, which for the natural instruments, particularly in the low notes, were of course impossible. Michael Wöggel of Augsburg's attempt (1780), by introducing two slides, to furnish the trumpet, at least in the upper part of the natural scale, with a complete chromatic series of notes *(Inventionstrompete)*, was really a retrogression, as the slide arrangement had long been proper to the trumpet, but had ceased to be so (cf. 78). Weidinger's key trumpet (1801, in Vienna), was merely an introduction of the system of keys in the real trumpet. Asté of Paris, combined keys and slides, and then of course required fewer keys. The idea of the valve was first hit upon by the Englishman, Clagget (1790), and indeed for the horn; he in fact combined two complete horns, one of which was in the key of D and the other in E♭, in such a way that they both had the same mouthpiece, and a single key shut off the wind from either at will. Thus he obtained, at least for the highest octave of the instrument (8th to 16th natural note), a complete chromatic scale with exception of a few notes requiring correction (by forcing or stopping). This system did not come into use. A happier idea was that of the Silesian, Blühmel, who, instead of combining two complete horns, forced the wind, by means of a simple contrivance (valves), not only through the tube of the instrument, but also through one or more additional pieces of tube inserted in the middle of it. He made his invention about 1813, and sold it to Heinrich Stölzl, Royal *Kammermusicus* at Plesse, who made it known in 1815, and excited just attention. Stölzl's valve horns had only two valves, and therefore sufficed for the production of a full chromatic scale only in the two highest octaves; similar ones were made in Paris by Dupont (1818); while Müller of Mainz (1830) and Fr. Sattler of Leipzig added a third valve, by which the compass of the instrument was increased chromatically to over three octaves. Stölzl made

such instruments of four sizes, viz., in F or E♭ (valve horn; he called it *bass trumpet*), in B♭ (named the *tenor trumpet*), high F or E♭ (valve trumpet) and high B♭ (also called a trumpet, but smaller, probably identical with the *cornet à pistons*). The French horn player, Meifred, in 1826, invented the slides for regulating the length of tubes connected with the valves, when the key changed. The oldest kind of valves, those of Blühmel and Stölzl, were pistons; the newer kind, the cylinders, were invented by A. Sax. The differences of construction are not very important; their object is partly to render the course of the wind more free, and partly to facilitate the manipulation of the instrument. The chief point in all is the same, viz., that some additional curved tubes, changing the course of the wind by means of valves, can be brought into communication with the principal tube, which is thus lengthened by so much, and the note consequently lowered.

89. What brass instruments are now provided with valves?

All. Natural instruments are disappearing before the valve instruments more and more, and are only preserved in a few first class symphonic orchestras. And the slide arrangement of trombones also appears as if it would have to yield to the valves. To lament over this, and strive against the unmistakable current of time, is useless. On the other hand, art has a lively interest in preventing the loss of those shades of tone which natural horns, trumpets and trombones, produce in their greatest purity. Valve trumpets and valve trombones have by no means the full characteristic timbre of the natural trumpets and slide trombones; but this is not the result of the introduction of valves, but of the altered size of the bore, which has been modified, unhappily, in the direction of the wide-bored *Bügelhorns*, to make the instrument speak more easily, especially in melody playing. With all energy musicians should withstand the too great increase of instruments copied from the *Bügelhorn*, as their shrill upper notes, bleating middle notes, altogether too heavy low notes, and their unpoetic tone in every register, are in no wise substitutes for the clear trumpet, the elegiac horn or the solemn trombone. Symphonic and operatic orchestras must insist on the preservation of instruments with narrow bores and spreading bells; let the wind bands, which, as sub-

stitutes for the string orchestra, require agile instruments of all registers, make use of those with wide bores. The *cornet à pistons*, a descendant of the old *Posthorn*, is likewise out of place in the symphony orchestra, as its small length (it is a small kind of horn, octave instrument of the highest horns, blown through a trumpet mouthpiece) admits of only a small volume of tone; and this is still further impaired by the narrow bore, so that the *cornet* is little superior even to the high *Bügelhorns* (the tone is less ordinary but much too puerile, almost toyish.)

90. What valve instruments are made after the pattern of the Signalhorn (Bügelhorn)?

A complete family, indeed, particularly in the low notes, more than complete, for which the French have the general name *Saxhorn* (after the inventor A. Sax); in Germany, however, and elsewhere a number of different names are used. As is known (88), the *Bügelhorns* once played the part of chromatic instruments, for instance when they were provided with keys (key-bugle and ophicleide). After the introduction of the valve mechanism in these instruments, those instruments appeared which are now used in all wind and military bands, viz., the *piccolo* in E♭ (small saxhorn) for the high soprano register (melody instrument), the *Flügelhorn* in B♭ (soprano saxhorn) for moderately high soprano (also melody instrument, substitute for the key-bugle), the *Althorn* in E♭ *(Altsaxhorn)* pitched an octave lower than the *piccolo*, and the *tenorhorn* in B♭ (tenor saxhorn), an octave lower than the Flügelhorn in B♭. These four do not use the first (lowest) natural note, and therefore require only three valves to produce the chromatic scale. Those still to be mentioned, have, on the contrary, four valves (here and there, more) and are all to be regarded as bass instruments, that is as substitutes for the ophicleide, viz., the *tenor-bass* in B♭ (Bass-saxhorn, also called Euphonium, Baryton or Bass-tuba), of the same register as the tenorhorn; but, using the first natural note, it consequently reaches a sixth lower (down to G G); the *bombardon* in E♭ (deep bass saxhorn) a fourth lower in pitch, but used scarcely any lower; and the *contrabass tuba* in B♭ (bombardon in low B♭, contrabass saxhorn, helicon), an octave lower than the bass tuba, and used down to E E E♭.

91. Are these instruments never used in symphony and opera orchestras?

One might say no; for the few exceptions prove the rule. It is only the lowest bass instruments that cannot be dispensed with, as the bass trombone is disappearing and the tenor trombone only reaches to great E. They are, however, written for as though they were in C, that is, as they sound. Moreover, there have been made in recent times, for the orchestra, bombardons in F (reaching well to double C), and contrabass tubas in C (good to GG).

92. What is the nature of the new brass instruments required by R. Wagner in his Nibelungen?

The tubas in the *Nibelungen* are a species of *tenor horns*, but with horn mouthpieces and horn bells; and as they have four valves, their lower compass is more considerable and chromatically complete. The tenor tubas (in B♭) command the register of high horns in B♭, the bass tubas (in F) that of horns in F but a little increased in the low notes (they do not use the first natural note); the tone is nearly that of the horns, but it has taken something of the character of the *Bügelhorns*, and chromatic progressions are easy to produce. Wagner's bass trumpets were really intended to be bass instruments of the trumpet type, but the attempt to make instruments capable of satisfying Wagner's requirements in the upper notes, was unsuccessful. Consequently, for the performance of the bass trumpet parts (in E♭, D, C) a particularly wide-bored trumpet in C, is used. Wagner's tubas, as well as his bass trumpets, are therefore approaches of the pure type of horns and trumpets to the *Bügelhorns*.

93. Is not the saxotromba similarly of a mixed type?

Certainly. Both bore and mouthpiece stand half way between the horn and *Bügelhorn*. A. Sax made these instruments of 7 sizes, the highest of which (in B♭) is smaller than the *Kornett* (the natural notes lie an octave higher), but the lowest is three octaves lower. Although these have been in existence 50 years, they have not become much known.

94. Might the now general system of valves for brass instruments be taken as the final development, that is to say, is the intonation of the chromatic scale obtained by their means, satisfactory?

The intonations are good while there is no necessity for using more than one valve at a time, nor for altering

the pitch of the instrument by inserting a crook. If a lowering crook be inserted all the valves give intonations which are too high, and the combination of several valves also gives intonations which are too high. To do away with these inconveniences, Ad. Sax has invented a new system of valves, which is beyond doubt destined to supersede the other. Instead, for instance, of inserting into the principal tube by means of the valves, additional tubes which lower the note, (system of the lengthening or additional valve), Sax, by means of the valve, cuts out longer or shorter pieces of the tube, and employs as many as six valves, each of which includes all those which cut out smaller pieces. The sixth valve cuts just enough out to raise the note a semitone, the fifth raises it 1 tone, the fourth $1^1/_2$ tone, the third 2 tones, the second $2^1/_2$ tones and the first 3 tones. Sax has applied this system to horns, trumpets, trombones, *Kornetts* and *Bügelhorns*. For instruments with these new Sax shortening-valves (pistons indépendants), no crook is needed, and every intonation is as pure as it could be on an instrument which has to produce both *tempered* and *untempered* (pure, natural) notes.

95. Has not A. Sax also called a new family of reed instruments into existence?

Certainly; that of the saxophones. These instruments have each a conical sound-tube like the oboe and bassoon, but a single beating reed like the clarinet. The saxophones, therefore, stand half way between clarinets and oboes or bassoons. They do not overblow like clarinets into the twelfth, but like all other wind instruments (except stopped organ pipes) into the octave. The saxophones belong entirely to the class of wood wind instruments; that they are made of metal, is of no more importance in respect to them than to flutes and clarinets, in which the same occasionally happens. Sax made these instruments of 6 sizes (high soprano to bass), but each in two keys. The instruments intended for military music are in B♭ and E♭, and those for the orchestra in C and F. Hitherto, the saxophones have been introduced into the orchestra only by a few French composers of opera, and the French and Belgian military bands have accepted them.

96. What kind of an instrument is the Sarruso phone?

It is an imitation of the saxophone, a metal instrument with a conical tube, and played, like the oboe and bassoon, through a double reed, but having a wider bore, it gives a louder tone. It was invented in 1863 by Sarrus, conductor of a French military band, and made by Gautrot of six sizes (soprano to contrabass). Up to the present, the instrument has gained but little ground, but it is anticipated that the contrabass sarrusophone may prove a fit substitute for the contra-bassoon, so cumbrous on account of its narrow bore (v. Gevaert, *Neue Instrumentenlehre*).

97. Did the Basshorn which became a favourite for a short time at the beginning of this century belong to wood, or to brass wind instruments?

It was really a near relation of the serpent, that is to say, a descendant of the old *Basszinken*, but it was made of wood and was similar in shape to the bassoon; it had an S-shaped neck, but a cup-shaped mouthpiece and a brass bell. It soon disappeared, as was only to be expected of such an atavism, without originating a family, or attaining to improvement.

98. How may we group modern wind instruments suitably and synoptically?

As flutes, reed instruments, and instruments with cup-shaped mouthpieces. Flutes are now represented only by the cross flutes, octave and *piccolo* flutes; the varieties of the large flute formerly in use, which were pitched a semitone, and a tone and a half, higher, have almost entirely disappeared, and of piccolo flutes only the one pitched a semitone higher is to be found in military music. In France and Belgium the last species of the beak-flutes, the flageolet, is also disappearing. The *reed instruments* are: the oboe, English horn or *cor anglais*, bassoon and contra bassoon, the descendants of the *Schalmeien* and bombards; the clarinets, basset-horn (obsolete) and bass clarinets; the saxophone and sarrusophone. The *instruments with cup-shaped mouthpieces* are: I. Natural instruments (disappearing) viz., the French or natural horn and natural trumpet. II. Instruments with slides, viz., trombones (slide trumpet). III. Instruments with keys, viz. the key-bugle, key-trumpet, ophicleides (obsolete). IV. Instruments with valves, viz., valve horns, valve trumpets, cornets à pistons, valve trombones, valve *Bügelhorns* (including tubas and bombardons), saxotrombas, Wagner's tubas and basstrumpets.

99. What percussion instruments has the modern orchestra?

Pretty well all that we have found among cultivated peoples from antiquity. The first to mention are the kettle-drums, which show improvement compared with those of antiquity, inasmuch as they no longer serve merely for marking the rhythm but, by means of a lately essentially simplified mechanism (mechanical drums), can be tuned to fixed notes, and therefore used for harmony and indeed for melody. Their first appearance in the orchestra was in the company of trumpets. Instruments of percussion likewise producing notes of fixed pitch are: the *Glockenspiel*, and the scales of tuned bars which replace it. Both probably are of Chinese origin (cf. 34) and have been introduced into Europe by the Dutch. As related to these, we must mention, by the way, the wood and straw instrument that we already found to be an anciently known instrument in Germany or Switzerland (79). Percussion instruments of indefinite pitch are: first the drums, relatives of the kettle-drums, also very old instruments now distinguished, as, the deep-toned *big drum* (*gran tamburo*, *grosse caisse*, *Türkische Trommel*), used almost exclusively for strengthening the chief rhythmical beats, but occasionally for rolls and thunder effects; the likewise deep-sounding long side-drum (Ger. *Roll-* or *Wirbeltrommel*, Fr. *caisse roulante*); the clear-sounding side-drum (Ger. *Militärtrommel*, with snares stretched across its lower head); the narrow long *tambourine* (Ger. *Tamboril*, Fr. *tambourin*) of the Provençales and Basques; and the real *Basque drum*, the little hand drum with jingles (tambour de Basque, called in Germany *Tamburin*, by the Spanish Gipsies *pandero*). Among metal plates designed for producing noisy strokes or menacing clatter, we must mention in the first rank the *Turkish cymbals* (Ger. *Schellen*, It. *cinelli*, Fr. *cymbales*) employed in pairs, and further, the *gong* imported from China. The *triangle*, acquired from the Turks like the big drum and cymbals, is only a ringing, clinking instrument; finally, we must remember the *castanets*, consisting of small wooden concave shells, which are struck rapidly together. They were probably brought to Spain and S. Italy by the Arabs, and are used for the rhythmical accompaniment of dances.

100. What instruments played by plucking the strings are known in the modern orchestra?

This class has lately become greatly reduced. Of lutes, only the little mandoline and the not much larger guitar still survive; but neither any longer forms an essential element of the orchestra; they appear occasionally only as national characteristics (of Spain and Italy). But the harp has been extraordinarily improved in recent times; in the 17th century, in the Tyrol, it received the easily movable hook for tuning the strings a semitone higher; in 1720 Hochbrucker introduced the pedals for simultaneously altering the pitch of all the notes of the same name; and in 1820 Erard of Paris introduced the double-action pedal by which the pitch can be raised either one or two semitones; nevertheless, the harp is not admitted into the symphony orchestra, and it is only quite lately that it enters more frequently into the opera orchestra. The chief substitute for the lute-like instruments, which from the 16th to the 17th century played a prominent part, is now the *pizzicato* of the bowed instruments, although this short sound cannot well be compared with the more prolonged sound of the former. A stringed instrument which during the last decade has obtained great favour amongst amateurs, the cither, played with a plectrum, is a descendant of antique instruments, viz. of the Chinese *kin*, of the Indian *vina*, of the Assyrian *sambuka* (43), of the Hebrew *nebel* (44), of the Greek psaltery (51), of the mediæval *sambiut;* but this instrument has not yet made its way into the orchestra, nor is it fitted to do so on account of its sentimental sound. Varieties of the cither are: the *bowed cither* (played alternately with the bow or fingers), and the *bass* or *elegiac cither.*

101. Has the modern orchestra no bowed instruments but those copied from the violin, viz. the viola, violoncello and double-bass?

Quite exceptionally only, the *viola d'amore* has been used. It is a bowed instrument with seven strings for playing on (of catgut) and seven wire resonance strings running under the finger-board. A larger species, the bass instrument of this type, was the *baryton*, Prince Esterhazy's favourite instrument, for which Haydn wrote numerous solo pieces. The baryton was of the size of the cello, and had seven strings for playing on, and from nine to twenty-four resonance strings. These instruments are not to be confused with the old lyres (cf. 72).

102. How has the piano developed in later times?

When the clavicembalo (cf. 65) became the instrument most preferred for playing the thorough-bass accompaniments of the earliest compositions in monody style (about 1600), the need of increasing its compass and volume of sound became more and more pressing. Accordingly, a clavicembalo of the year 1574, by Baffo, to be seen in the museum of Venice, has already a compass of $4^1/_2$ octaves (C to f^3); and the names of *archicembalo* and *gravicembalo*, appearing about and before 1600, indicate an increased compass in the lower notes. Clavicembalos of Andreas Ruckers', preserved at Antwerp and dating from 1623 and 1624, already have a compass of five octaves; one of them has two keyboards one above the other. But these large claviers were always exceptions; $4^1/_2$ octaves remained for a long time the usual compass. The double keyboard in the piano was no doubt copied from the organ, just as the pedal was later. Hans Ruckers, the elder, in 1590 already made such double-manual *Kielflügel* (the wing-shaped harpsichords). The upper manual either governed a set of strings of a different kind (pitched an octave higher, or catgut instead of steel strings), or else had a different kind of quills (e. g. leather tangents instead of crow-quills), or, on two-stringed instruments, it would make only one string sound, while the lower manual made both sound. Later (in Bach's time), these two-manual instruments were specially prized, because certain modes of playing peculiar to the organ (crossing of the parts, etc.) were possible on them without being too troublesome. Many improvements, regarded with pride in their time, seem to us now as trifling, e. g. the harp or lute draw-stop; pedals, which caused a rattling of the strings; the *Glockenzug*, which set little cymbals sounding, etc. Only Pascal Taskin's *jeu de buffle* (leather tangents), about 1768, became widely known and highly esteemed. The pantalon stop which put the dampers out of action (evidently the forerunner of our loud pedal) already indicates by its name the instrument from which our present pianoforte was to be developed, like the clavichord from the monochord, the clavicembalo (harpsichord) from the dulcimer (Ger. *Hackbrett*), and the clavicitherium from the harp. We must also mention the transposing clavicembalo, which, at the beginning of the

17th century, enabled the player by means of a pedal, to move the keyboard several semitones to the right, or to the left, and so mechanically to transpose the composition. Notwithstanding the numerous pains taken, complicated instruments like Franz Jacob Spath's *Tangentenflügel* (tangent piano) with 30 changes, or still more J. V. Milchmayer's *Mechanischer Flügel* (mechanical piano) with 250 modifications, remained curiosities which vanished, without leaving a trace, before the long sought and finally discovered improvement of the instrument by the introduction of the hammer mechanism, which constituted it a pianoforte.

103. What is to be observed concerning the development of the pianoforte?

Even in the middle ages, from the ancient psaltery (the Assyrian sambuka, 43), the dulcimer (Ger. *Hackbrett [Sambiut]*), which was struck with two little hammers, had developed. Nevertheless, instruments of this kind, it appears, remained small and capable of but little execution, so that their peculiar advantage of allowing the player to graduate from loud to soft as he liked, was scarcely noticed. In 1700, when Pantalon Hebenstreit, professor of the pianoforte and dancing, at Leipzig, hit upon the idea of enlarging and in every way improving the despised instrument played only in the village taverns, covering the wooden hammers with leather, for example, it for the first time attracted general attention. In 1705, Hebenstreit made a sensation at the Parisian court by his playing (Louis XIV. named the instrument after its inventor *pantalon*), and it was not long before piano manufacturers sought to introduce the hammer stroke into the mechanism of the piano. The honour of being the first to solve the problem, and in a most satisfactory manner, belongs to the Florentine instrument manufacturer Bartolomeo Cristofori, custodian of Ferdinand of Medici's collection of instruments. His instrument, first described, in 1711, by the Marchese Maffei, in the *Giornale dei letterati*, called the *piano e forte*, had little leather-covered hammers on a special strip of board, an escapement by means of a spring, which forced the hammer back after the stroke, checks to prevent the hammers from rebounding before a new stroke, and separate dampers for each key, in fact all the essential elements of the afterwards so-

called *English-action.* A few years after Cristofori (1716), Marius appeared in Paris, and Chr. G. Schröter (1717) in Nordhausen, but their models were primitive and imperfect, and never attained to any practical value, so that they scarcely merit the place of honour assigned to them in musical history. Cristofori's instruments seem to have been but little used, yet we can hardly err in assuming that Gottfried Silbermann, who first made the instrument generally known, was acquainted with Cristofori's labours at least by description, since his own *action* nearly coincided with Cristofori's. In any case, Maffei's description had appeared in Hamburg in 1725 in a German translation, and in 1726 Silbermann began the manufacture of instruments of this kind. Silbermann's instruments soon won the approbation of J. S. Bach and also of Frederick the Great. Further merit for the construction of pianofortes, by the side of which the clavichord and *Kielflügel* maintained their place throughout the whole of last century, belongs to Silbermann's pupil, Geo. Andr. Stein of Augsburg, the inventor of the so-called *German* (Viennese) *action*, in which the hammers are immediately attached to the key levers (no longer in favour); further to Andreas Streicher, Stein's son-in-law, who removed the business to Vienna, and also especially to John Broadwood of London, who after an idea of Americus Backers', still further improved Silbermann's action, on account of which it is now called *English.* Broadwood also at the same time, first improved the construction of the table-shaped pianos. The most important improvement made later (apart, of course, from the certainly not unimportant improvements in the manufacture of case, strings and resonance) is the *double-escapement (doppelte Auslösung, double échappement)* of Sebastian Erard of Paris (1823, his name was properly Erhard and he came from Strassburg). Particularly worthy of mention also, is the *downward action* first attempted by Streicher in Vienna, and after him by Pape in Paris (after 1815) who gained by it enduring fame, as the action of the upright piano was developed from it. The celebrated method of crossing the strings, first introduced by the Brunswick — now New York — manufacturer Steinweg (Steinway), rendered it possible to shorten the piano without shortening the strings, and so gave rise to the short (drawing-room) grand pianos; but the

same method is also employed in the concert grands as well as in every other kind. The *aliquot* pianos of Julius Blüthner of Leipzig, beautify the tone by the addition of an *upper series* of strings, tuned in octaves and having separate dampers. Among improvements in the damping or damping-lever mechanism, must be especially mentioned Debain's tone-sustaining pedal (Ger. *Tonhaltungspedal*, Fr. *prolongement*) by means of which any note or chord could be prolonged at will while the hands continued playing (improved by Steinway in 1874); also Ed. Zachariäs' *art pedal (Kunstpedal)* which divided the keyboard into 8 parts, any one of which could be made free from the action of the dampers. For the sake of completeness we mention here the attempts made of late to remodel the keyboard by establishing an unbroken interchange of black and white keys throughout the entire compass (chromatic keyboard). The difficulties of fingering which arise thus, Paul von Janko lately (1882) sought to obviate by means of his *Terrassenklavier* (terraced keyboard) which gives each key three points where the finger may touch, and appears to the eye like six series of keys one above another.

104. Has it not also been attempted to make strings sound by means of a keyboard as they are made to sound in the bowed instruments?

Certainly. The first attempts of the kind, the hurdy-gurdy and *Schlüsselfiedel*, we already found in the middle ages. Really larger clavier instruments, in which the strings (of catgut) were exposed to friction by means of a keyboard, were: Hans Heyden's *Nürnbergisches Geigenwerk* or *Geigenklavicimbal* (1610), in which little hooks controlled by the keys drew the strings against resined wheels set in revolution by a treadle; the similarly constructed *Klaviergambe* of Georg Gleichmann of Ilmenau (1709); the *Bogenklavier* of Hohlfeld of Berlin (1754); the *Bogenflügel* of Mayer of Görlitz (1795) and of Kunze of Prague (1799); and the Xænorphica of Röllig of Vienna (1797), the latter playing each string with a little bow. A combination of the *Bogenflügel* and *Hammerklavier* was attempted by Karl Greiner (1779, *Bogenhammerklavier*). All these experiments remained unproductive of enduring advantage to art.

105. Has it not also been attempted to produce the effect of the Æolian harp on clavier instruments?

Yes; in 1789, J. J. Schnell of Paris, first constructed his *animocorde* (anemochord) the strings of which were played by wind artificially produced. The same idea lay at the foundation of Kalkbrenner and Herz' *œolian piano;* but it proved itself as little capable as Schnell's of rendering higher service to art.

106. Has it not also been attempted to introduce other tone-giving bodies in the piano instead of strings?

Yes; even apart from the pipes, which we found quite at the beginning of the middle ages with a keyboard in the form of small organs. Of later date are the attempts to make steel bars and glass bells or cylinders sound by means of friction while each separate note could be played by means of a keyboard. To these belong: Franklin's *harmonica* (*Glasharmonica,* 1763), which, however, had not yet keys, but the bells had to be touched with the fingers; afterwards, however, it was furnished with keys by its improvers (Hessel, Wagner, Röllig, Klein); also Chladni's *euphon* and *clavicylinder.* A clavier instrument which makes tuningforks sound by means of a hammer-stroke, is the *adiaphone* made by Fischer and Fritzsch of Leipzig (1882).

107. When did the harmonium first appear?

At the beginning of this century. But the Chinese had long been acquainted with free reeds (Tscheng: cf. 11). In the West, however, it appears that their first employment, instead of the beating reeds solely used in the regals and organs, was in 1800 by Eschenbach, warder of the tower of St. Michael's church in Hamburg (Æoline). In 1810, in Paris, Grenié attracted considerable notice by his *orgue expressif,* as, by its means, he showed for the first time the power of a free reed to produce a *crescendo* or *diminuendo,* thereby inventing the harmonium properly so-called, in which as is well known the wind can be increased by a more active use of the pedals, or by special pedals controlled by the knee. Häckel, in 1818, named a similar instrument *physharmonica,* and the names of *œolodicon, aerophone, melophone* and others were introduced, until, in 1840, A. Debain patented his *harmonium* with several stops, whereupon this name became general. Later inventions relating to the harmonium are: the *percussion* (a hammer-stroke to promote a quicker response of the reeds), the double-point of pressure, for obtaining two

degrees of loudness apart from the *swells*, and the prolonging of single notes copied from the piano (cf. 103). The so-called American organ (since 1860, made by Mason and Hamlin in Boston) like the *Alexandre* organs (made by Alexandre in Paris since 1874), differ from the ordinary harmonium only in the reeds, which are made to speak not by the wind being forced out but by its being drawn in (the bellows rarefy the air in the wind-chest by pumping it out, so that air streams in at the reed-openings).

108. How has the organ developed in modern times? About the time when independent instrumental music, and especially piano and organ music, began to be developed, the construction of the organ was already highly developed; that is, instruments were made with several (3) manuals and pedals, a complete chromatic scale through several octaves, and a considerable number of open and covered pipes of different sizes, and even reed stops and mixtures, with other auxiliary stops. In the present century improvements have been limited to a multiplication of the tone-colours through all kinds of changes in the bore, half covering, partly through a curious form of the pipes of the reed-stops, and all kinds of small improvements in the lever mechanism, which facilitated playing and the drawing out of the stops. A more important invention by Chr. Förner (1675), was the wind-gauge by means of which it first became possible to properly regulate the wind-power in the different wind-chests, and in the registers above them. The oldest form of the division of the registers was probably a division of the wind-chest into registers so that the draw-stop, as with the pallet now, opened a way for the wind to the wind-groove of all the pipes of the register, while the pressing down of a key moved a slide which put the pipes into communication with the corresponding wind-groove. For we know positively, that the oldest playing valves (Ger. Spielventile) were such slides; and this explains the difficulty of playing the organs of that time, when many pipes stood over such slides, because the slides were of considerable length. Instead of the slides in connection with the keys, the organ builder, Timotheus of Würzburg, at the beginning of the 15th century, is said to have invented the spring valves (all belonging to one key

probably being moved simultaneously by a common *tracker*, Ger. Traktur), and so originated the old wind-pipe (Ger. Springlade). But the old slides, not very long after, came again into repute, but with altered functions; for the slides, which it appears came into use in the 16th century, shut, on the contrary, the way of the wind to all the pipes of a register, that is, the slide is no longer a playing (or key-) valve but a register (or stop-) valve. On the other hand, every key has its own particular subdivision (wind-groove) of the wind-chest. Over each separate wind-groove, therefore, stand the pipes belonging to a key, not those belonging to a register, and every key, therefore, controls only one valve, that of the wind-groove. This century has now revived the old wind-pipe (*Springlade*) in the improved form of the pallet (Ger. *Kegellade*). The *Kegellade* is the invention of Walcker of Ludwigsburg (1842). A substantial removal of the difficulties of organ playing, was effected by the ingenious invention, by the English organ builder C. S. Barker (1832), of the *pneumatic lever*, which transferred the work of lifting both pallets and slides to small auxiliary bellows. The same master of the art of organ building (died 1879) also, in later life, invented the electric action, by means of which the easiest manner imaginable of playing on the keyboard was combined with the quickest imaginable effect of the action, so that the response of the pipes became the promptest possible. An invention similar in effect to the pneumatic lever is the *tubular pneumatic system*. Eminent distinction for the further improvement of the organ, is also due to the Parisian organ-builder A. Cavaillé-Coll (born 1811), who amongst other things employed separate wind-chests, with wind of different degrees of strength, for the lower, middle and higher parts of the keyboard, invented the harmonic flutes, and the so-called combination-pedal, by which several loud stops might be forced out in a group and the sound thus strengthened. We must also mention the Abbot Vogler, who at the beginning of this century perhaps made more stir than was necessary, but nevertheless did away with many a useless complication, and drew public interest from numerous trifles to essentials.

109. What is to be said concerning the automatic musical instruments so extensively developed in later times?

They are chiefly of two kinds, namely, those with

pipes like the organ, whether flute or reed pipes of all kinds of shapes, which are made to sound by means of wind as in the organ; and those in which small metal rods are twanged with pins. In the first (which date at least as far back as the beginning of last century), a barrel furnished with pins which open the valves communicating with the pipes, is generally turned by a handle (barrel-organ), while in the latter the cylinder is generally turned by clockwork (musical boxes). Nevertheless, instruments of the former class, especially large ones, are also made to play by mechanical means *(orchestrion)*, while many cheap musical boxes have no clockwork, but are set in motion by means of a handle. Celebrated orchestrions are: Flight and Robson's *Apollonicon* (1812, built in London); Friedrich Kaufmann's *Symphonion* (1839); Fr. Theodor Kaufmann's *real orchestrion* (1851, in Dresden); and Peter Singer's *pansymphonicon* (1839, in Salzburg). The piano organ also, now a favourite street instrument, must not be forgotten; in this instrument, just as in the barrel-organ, by means of a cylinder set with pins and turned by a handle, hammers are made to strike the strings, so that we have mechanical piano playing. More artificial pieces of mechanism, such as Kaufmann's *Trompeter-automat* or singing bird etc., belong, not to the history of music, but to that of mechanics or machine construction.

BOOK II.

HISTORY OF TONE-SYSTEMS AND NOTATIONS.

FIFTH CHAPTER

THE TONE-SYSTEMS AND NOTATIONS OF ANTIQUITY AND OF ORIENTAL PEOPLES.

110. What do we know of the tone-system of the Ancient Egyptians?

As good as nothing. In reference thereto, we are almost entirely driven to conjectures and conclusions

drawn from Greek music. The founder of the mathematical theory of the Greeks, Pythagoras (6th century B. C.), is said to have been initiated by the Egyptian priests into their ancient wisdom; we may therefore assume that the Pythagorean definition of tone relationship according to fifths (2 : 3) or fourths (3 : 4), as well as the division of the scale into seven degrees, was known to the Egyptians. For the last, we have the express testimony — in much later times, of course, — of Diodorus Siculus (time of Augustus), who relates that Egyptians compared the seven degrees of the scale to the seven planets (including the sun and moon according to the ancient view). Perhaps the Egyptians had a simple seven-degree notation corresponding to this (possibly composed of the hieroglyphics used for the stars); but we have no authentic information on the subject.

III. Have we any information in regard to the tone-systems of the Western Asiatic peoples, of the Assyrians, Babylonians and Hebrews especially?

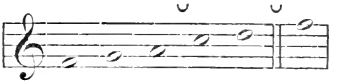
No. Yet we may also draw conclusions respecting their music from that of the Greeks. Two of the principal scales of the Greeks, viz., the Phrygian and Lydian, point to Asia Minor; and flute-playing appears to have been an art specially prized by the Asiatics. Of the Phrygian flautist Ulympos (the elder) it is related, that he introduced the older enharmonic system, that is to say, that by leaving out two notes, he reduced the scale of seven notes to one of five. Hence one may justly conclude that the Western Asiatics were acquainted with that archaic scale of five degrees which had no step of a semitone, and which we find alike in the furthest East (China), and West (Scotland). If the Greeks obtained the scale of seven degrees from the Egyptians, and the one of five degrees from the Asiatics, it still remains a question, considering the altogether mythical nature of the traditions concerning Ulympos, whether the five-degree enharmonic system indicated a return to an antique form of musical art, or whether it formed the preliminary stage fallen into oblivion, from which an advance had been made to the Egyptian system of seven degrees. In any case, the later enharmonic system of the Greeks, with its quarter-tones, was fundamentally different from it; although it cannot be denied that it also points to the manifold methods of tuning instru-

ments, which played such a prominent part later among the Orientals (Arabs, Persians, Indians), and to the distinction of smaller intervals than the semitone.

112. So we are better informed concerning the Ancient tone-system of the Chinese?

Yes. Although with the Chinese as with all other peoples, myth has taken possession of the oldest records relating to music and musical instruments, it nevertheless appears certain, that in the oldest music of the Chinese, the scale of five degrees was used, that is, one which had no step of a semitone. Prince Tsay-Yu is said to have met with great opposition from musicians when he introduced the two notes which completed the scale of seven notes. The five notes were deduced from each other at intervals of a fifth, the starting note (lowest) being termed the *great* note or *Emperor's palace.*

The scale built up from the following five notes, viz. f (kung) — c (tsche) — g (tschang) — d (yu) — a (kio),

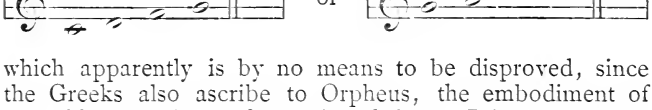


appears to us poor and capable of but little melodic development. Nevertheless the melodies founded upon it are healthy, vigorous, always free from the weakness of chromatic music, and at all times equally comprehensible whether minor or major. One can scarcely err in regarding the third (as an element of the harmony) as entirely foreign to these antique systems, that is to say, every note in such a melody was in modern phraseology either the fundamental tone or the fifth, but not the third:

$$\begin{matrix} c & & g & & d & & a \\ f & \ldots & c & \ldots & g & \ldots & d \end{matrix}.$$

Thus considered, a well constructed melodic arrangement seems very possible; if we assume $\frac{g}{c}$ to be tonic harmony, then $\frac{c}{f}$ represents the subdominant and $\frac{d}{g}$ the dominant, whilst $\frac{a}{d}$ affords the possibility of modulating into the dominant key. On the other hand, however (more in a minor sense), we may also suppose $\frac{d}{g}$ to be a tonic har-

mony, in which case, $\frac{c}{f}$ compels a modulation to the side of the subdominant. But the actual scale of a complete key (without the modulation) would then appear to be reduced to only four notes, namely:



which apparently is by no means to be disproved, since the Greeks also ascribe to Orpheus, the embodiment of the oldest music, a four-stringed lyra. Prince Tsay-Yu, therefore, changed this original scale into one of seven degrees by introducing the *mediant* e (*tschung* or *pien-kung*) and the *leading note* b (*lio* or *pien-tsche*). But they did not stop here. The antique sacred *king* exhibits a complete chromatic scale of twelve degrees. They passed over the new fifths $\frac{e}{a}$ and $\frac{b}{e}$ added by Prince Tsay-Yu, until they came to a note which also formed the same interval (if only approximately) with the tonic (F), that is they carried the circle of fifths through the five so-called *additional keys:* f♯ — c♯ — g♯ — d♯ — a♯ (b?). As peculiarity quite unique in its kind, we may further mention that the Chinese call the high notes low and the low notes high. Moreover, the names of the notes just given are not the only ones; they also divided the 12 degrees into twice six, each series of which proceeded by intervals of a tone:

f — g — a — b — c♯ — d♯

and

f♯ — g♯ — a♯ — c — d

and from this curious division gave them names accordingly. The Chinese were acquainted with the octave species as well as the transposition scales (v. 115), and consequently distinguished in all 84 keys, as a transposition of the fundamental scale could be produced from each of the 12 degrees *(lu)*, while the fundamental scale itself could have a sevenfold import, according as a particular note, recognized by the eye, were the first, second, etc., degree of the chosen compass of an octave. Octave-notes, the Chinese have always named alike. Their notation consists of the written signs corresponding to the names of the notes,

and (probably only in later times) of signs for marking the rhythm and embellishments.

113. What do we know of the tone-system of the ancient Indians?

The oldest works of the Indians on musical theory, belonging partly to Sanscrit literature, give no support to the statement that the Indians had originally a scale of five degrees; but this does not exclude such an assumption relative to remoter antiquity. The normal scale consists of seven principal notes (swara), whence it is called *swaragrama* or *septaka*. The names of the seven degrees are:

	sa	ri	ga	ma	pa	dha	ni
our	c	d	e	f	g	a	b

or rather, as *sa* corresponds in pitch, with our a:

a	b	c♯	d	e	f♯	g♯

These normal scales were also reproduced by transposition, in such a way that the altered (raised or lowered) notes retained their names; or else, as in solmisation (v. 127), the names of the degrees remained, and were therefore transposed; for example, if the pitch of sa = e, ga = g♯. But besides the *swaragrama* they distinguished numerous other shades, modes of singing and tuning, which were also regarded as particular keys, similar to what we find again among the Greeks and Arabs. The Indians divided the octave into 22 parts (struti) and distinguished larger tones of 4 struti each, smaller tones of 3 struti each, and semitones of 2 struti. If we put the values, which, according to such a calculation, would belong to the degrees of the *swaragrama*, beside those of our equal temperament or those of pure intonation, it is seen that the deviations were by no means of such a nature that our ears could not also endure them; for the third and major seventh were much purer than in our equal twelve-degree temperament Only the sixth, which, besides, has for a long time been determined as of different pitch by theorists even in the West (e. g. A as the 5th of D and third of F) showed a deviation of about $^1/_{10}$ tone, the fifth and fourth differed only by perhaps about $^1/_{30}$ tone (the values are given in logarithms to the base 2, as the easiest to follow):

c (sa)	0 000000	
d (ri)	0 166666	equal temperament
	0 169924	pure intonation
	0 181818	Indian = $^4/_{22}$ octave

e (ga)	0.318181	Indian = $^{7}/_{22}$ octave
	0.321928	pure intonation
	0.333333	equal temperament
f (ma)	0.409090	Indian = $^{9}/_{22}$
	0.415039	pure intonation
	0.416666	equal temperament
g (pa)	0.583333	equal temperament
	0.584962	pure intonation
	0.590909	Indian = $^{13}/_{22}$
a (dha)	0.737966	pure intonation
	0.750000	equal temperament
	0.772727	Indian = $^{17}/_{22}$
b (ni)	0.906890	pure intonation
	0.909090	Indian = $^{20}/_{22}$
	0.916666	equal temperament
c (sa)	1.000000	

With such values very intelligible music could no doubt be produced. Whether this division of the octave into 22 parts is really an old Indian one, or whether it has been influenced by the Arabian division of the octave into 17 parts, is not determined. The practical tone-system of the Indians comprised three octaves (A to a^2); yet the *vina* with its seven strings and nineteen bridges only reaches to b′ (two octaves and a tone). The rhythm of the Indians is described as very complicated and extremely free, and consequently very difficult to represent in our notation. The Indian notation (seldom used, however) indicated the notes by letters taken from their names, the rhythm and manner of performance being shown by all kinds of crooked and curved lines. Influence on Western notations it never obtained, and appears also never to have been influenced by such notations.

114. What is to be remarked about the Arabic tone-system of 17 degrees?

It appears to be very ancient, for in the 10th century B. C., Alfarabi tried to introduce the Greek system among his countrymen, but met with very determined resistance. The division of the octave into 17 parts is not to be understood in the same way as the Indian division into 22. The latter was beyond doubt only a theorem that could not be exactly realized in practice (no more than our twelve degree equal temperament can be) so that we are justified in assuming that musical

practice brought the values nearer to pure intonation than the above theoretical definition. On the other hand, the Arabian tone-system of 17 degrees could be carried out exactly without trouble, as it was produced by means of a series of 16 fifths (fourths) of pure intonation (calculated from the top downwards):

e — a — d — g — c — f — b♭ — e♭ — a♭ — d♭ — g♭ — c♭ — f♭ — b♭♭ — e♭♭ — a♭♭ — d♭♭.

But now the 8th lower fifth almost exactly agrees (difference = .0016, that is $^1/_{100}$ tone) with the upper third; or, the 17 degrees of the Arabian scale:

c d♭ e𝄫 d e♭ f♭ e f g♭ a♭♭ g a♭ b♭♭ a b♭ c♭ d♭♭
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

gave the following harmonies purer than our tempered system:

A major = a, d♭, e
A minor = b♭♭, c, f♭
D major = d, g♭, a
D minor = e♭♭, f, b♭♭
G major = g, c♭, d
G minor = a♭♭, b♭, e♭♭
C major = c, f♭, g
C minor = d♭♭, e♭, a
F major = f, b♭♭, c
B♭ major = b♭, e♭♭, f
E♭ major = e♭, a♭♭, b♭
A♭ major = a♭, d♭♭, e♭
C♯ minor = d♭, e, a♭
F♯ minor = g♭, a, d♭
B minor = c♭, d, g♭
E minor = f♭, g, c♭

Although in Antiquity and the early middle ages the Arabians probably played music in several parts as little as did the Greeks and other ancient nations, yet this ability to produce the consonant intervals pure, cannot be accounted as insignificant. And that the purity of the thirds was not accidental but the result of endeavour, is proved by the ancient Arabian *messel*-theory, the rules relating to intervals. This shows an acquaintance, indeed, not only with the consonance of the octave, fifth and fourth, but also with that of the major and minor third, and even that of the minor

and major sixth. The peculiarity of the *messel* method is this, that every interval is expressed by dividing the length of the deeper-toned string by that of the higher-toned one; this is the *messel* proper (unit of measurement). Thus, for instance, the definition of the octave = 2 M. (that is the length of the deeper-toned string contains twice that of the higher one), that of the fifth = 1 M. + $^1/_2$ etc. All the intervals are thus produced from the top downwards, and the Arabian monochord therefore does not, like the Greek one, divide the strings into two halves, three thirds, etc., but begins with a small portion of the string, for instance $^1/_8$, and multiplies this, whence arise a series of notes (under-tone series) which are the converse of the over-tone series, and give in their first six notes the minor chord: —

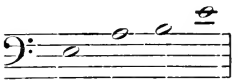
6	5	4	3	2	1
A	c	e	a	e′	e″

The 12 chief modes *(makamat)* of the Arabians and Persians have mostly seven degrees and differ only partly in the position of the semitones, like the Greek octave species and the mediæval church modes; thus *uschak* = major (Ionian), *newa* = Dorian, *buselik* = hypo-Phrygian, *rast* = mixo-Lydian; they are also partly distinguished by a slight difference in the pitch of single notes; for example, *husseini* = buselik, and *hidschas* differs from both only by the omission of the fourth; one answers to our ascending minor scale, but from fifth to fifth (*issfahan*, c d e f g a♭ b♭ c), and the rest show chromatic elements (*irak*, c d e f g g♯ a b c; *zirefkend*, c d e♭ f f♯ a♭ a b c; *büsürg*, c d e f f♯ g a b c; *sengule*, c d e f f♯ a b♭ c and *rehawi*, c d♭ e f g♭ a♭ b♭ c). It is evident that with these modes, and still more with the 24 branch modes derived from them as well as with the six strong keys *(awasat)*, it is more a question of the form of the melody than of what we now call keys or modes. A real notation, the Arabians seem not to have possessed; for explaining the scales, etc., they used the numerical signs of the notes. A glance at our exposition of the Arabian scales or at the Indian tone-system suffices to show that those oriental peoples (and the Chinese also) must have produced music by no means differing in principle from our own. With them all we unquestionably find the diatonic scale as the basis, and the quarter-tones of the Indians as well as the thirds of tones

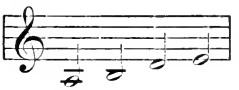
of the Arabians, we find upon close inspection to be new to us. If we compare our 12 degrees equal t ment with the acoustical values they represent, ther in our own music likewise, slight differences of pi great number, which in practical music, as soon as a question not of tempered but of free intonation, a very important part. The Arabic scale of 17 deg especially was an attempt at *unequal temperament*, such was again made last century in the West with a scale 12 degrees (Euler, Kirnberger) that is, after *equal tempera ment* had long been generally known.

115. We come to the Greeks. Was their tone-system also diatonic from the first?

Certainly. The oldest stringed instruments, like the lyra ascribed to Orpheus, are, indeed, said to have had only four strings, which according to Boetius were tuned thus: —



that is, as tonic (and octave), sub-dominant and dominant. But even assuming the four notes of the oldest scale to have been four different ones (without octaves), we may still not imagine a consecutive progression as in the later Greek tetrachord, but rather:



(cf. 112 and 116).

If we disregard an account of Aristides Quintilianus (1st to the 2nd century A. D.), who gives as the oldest scales, the mixed ones consisting of quarter tones (diesis), major thirds and tones, that is the scales derived from the later enharmonic system, we find in historical times, first a purely diatonic seven-degree system, with several distinct keys, or modes, within the octave (according to the position of the two semitones):

Dorian:	1/2	1	1	1	1/2	1	1
Phrygian:	1	1/2	1	1	1	1/2	1
Lydian:	1	1	1/2	1	1	1	1/2

or if we make our letters the foundation:

e f g a ‖ b c′ d′ e′ = Dorian
d e f g ‖ a b c′ d′ = Phrygian
c d e f ‖ g a b c′ = Lydian

of these scales was regarded by the Greeks as sed of two tetrachords of perfectly similar formation, ney consequently distinguished, not only the scale of ctave, but also the tetrachord, according to the position ıe semitone, as Dorian, Phrygian or Lydian:

$^1/_2$ 1 1 = Dorian
1 $^1/_2$ 1 = Phrygian
1 1 $^1/_2$ = Lydian.

That a further transposition of the semitone in the tetrachord was impossible, is probably the reason why the fourth (perhaps rather newer, but yet old) chief mode received a derived name, viz.

mixo-Lydian B c d e ‖ f g a b.

This scale is not divisible into two equal tetrachords, and it therefore obtained the name of a neighbour scale with the suffix *mixo* (mixed); that is, it was regarded as two Lydian tetrachords, but with one divided between the upper and lower notes (g . a . b — B . c). Later however the theorists proclaimed the opinion that the point of separation *(diazeuxis)* of the two tetrachords lay, not between f and g, but between a and b; that is to say, the scale was now made to correspond with two Dorian tetrachords (b c d e and e f g a) which were not disjunct, but connected by a note common to both (conjunct). This union was called *synaphe*.

Besides these three oldest chief modes (octave species) just as many derived ones were distinguished as would be produced if the upper tetrachord of one of them were transposed an octave lower; these scales, which group themselves round the *hypate* rather than round the *mese* (v. p. 57), received the prefix *hypo* to their original name:

A ‖ B c d e f g a = hypo-Dorian,

G ‖ A B c d e f g = hypo-Phrygian,

F ‖ G A B c d e f = hypo-Lydian.

A contrary transposition of the tetrachord was also introduced later, and afterwards octave species distinguished by the prefix *hyper*, which coincide, naturally, with some already given:

b c′ d′ e′ f′ g′ a′ ‖ b′ = hyper-Dorian = (mixo-Lydian).

a b c′ d′ e′ f′ g′ ‖ a′ = hyper-Phrygian = (hypo-Dorian),

g a b c′ d′ e′ f′ ‖ g′ = hyper-Lydian = (hypo-Phrygian).

As is easily seen, the diazeuxis lay in the middle of all the original modes, below in the hypo modes, and above in the hyper modes. To the mixo-Lydian only, this method of recognition would not apply; they nevertheless distinguished the following:

e ‖ f g a b c′ d′ e′ (?)
or e f g a ‖ b c′ d′ e′ } hypo-mixo-Lydian (= Dorian),

and f g a b c′ d′ e′ ‖ f′ ?
f g a ‖ b c′ d′ e′ f′ } hyper-mixo-Lydian (= hypo-Lydian).

In every respect, however, the favourite mode of the Greeks was the Dorian; they held it alone as worthy of a free man, regarding those with names suggestive of Asia — the Phrygian and Lydian — as on the contrary effeminate, exciting, etc. So then the whole further theory of this tone-system, springs from the Dorian mode, which played the chief part, at least as much as the major scale does now. The so-called perfect system of the later 15-stringed kithara, comprised two octaves, the middle of which formed a Dorian scale increased by a fifth downwards and by a fourth upwards; or, which is the same thing, four Dorian tetrachords were placed together, each two being conjunct, a diazeuxis in the middle, and an additional note added as the lowest, the lower double octave of the highest:

a′
g′ hyperboleon (extreme tetrachord).
f′
(e′
d′ diezeugmenon (disjunct tetrachord).
c′
b

Diazeuxis

a
g meson (middle tetrachord).
f
(e
d
c hypaton (lowest tetrachord).
B
A Proslambanomenos (acquired note).

The notes in each tetrachord had names partly relating to practical technique (lichanos = fore-finger), partly to their position in the tetrachord (the highest = nete, the third = trite, the second highest = paranete, the lowest = hypate, the lowest but one = parhypate), partly to their position in the entire system (mese = middle note, paramese = next the middle). The following summary will now be intelligible:

a′ Nete
g′ Paranete hyperboleon
f′ Trite
e′ Nete
d′ Paranete diezeugmenon
c′ Trite
b Paramese
a Mese
g Lichanos
f Parhypate meson
e Hypate
d Lichanos
c Parhypate hypaton
B Hypate
A Proslambanomenos.

It is not an accident that the *a* here lies just in the middle and is the only note which is repeated in the upper, and lower octave (the alpha and omega, so to speak, of the

entire system); for a passage in Aristotle shows beyond a doubt, that the mese had in practical music the importance of the *tonic*.

But besides this system of 15 notes to the complete scale (systema ametabolon) the Greeks distinguished one capable of modulation (metabolon) which was produced when the diazeuxis was not taken above the mese, but rather, by means of the mese as a common note (as with the hypate meson for the two lower tetrachords), a higher Dorian conjunct tetrachord was added (the tetrachord synemmenon):

d′ Nete
c′ Paranete | synemmenon
b♭ Trite

But whether the Greeks provided the kithara with a special string between the mese and paramese for the trite synemmenon (the only new note it required), or, as soon as a transition into the tetrachord synemmenon appeared, by simply turning a peg round, made b into b♭, must remain undetermined. They certainly had not special strings for the entire tetrachord as well as those of the diezeugmenon. Still, to suppose a special system synemmenon, reaching from A to d′, which had B below and b♭ above seems very illogical, as the octave from hypate meson to nete diezeugmenon constituted the real nucleus of the system. The use of the trite synemmenon signified nothing more than the modulation into the key of the subdominant; that is to say, as soon as the tetrachord synemmenon was entered, *a* lost its signification of mese and *d* became mese, and the whole two octave system from proslambanomenos to nete hyperboleon instead of reaching from A to a′, was rather to be represented as extending from d to d″:

d ‖ e f g a b♭ c′ d′ ‖ e′ f′ g′ a′ b♭′ c″ d″

Prosl. hypaton meson diezeugm. hyperbol.

therefore as transposed from A minor to D minor. But as the tuning of the entire instrument could not be changed, in face of such possibilities of confusion, they distinguished an importance of the notes according to their position on the instrument (mese as the middle string), and also according to their function in the harmony (mese as the tonic), the former was termed *thesis*, the latter *dynamis*. Only as long as the 8 middle strings (according to thesis, hypate meson to nete diezeugmenon) showed the

Dorian scale thesis and dynamis coincided. But as both the accounts of theorists and the tables of Greek notation show, every note could be lowered or raised a semitone; that is, the middle octave, which only the older seven-stringed lyra (seven-stringed, because it had 7 *different* notes) had at command, could give all the modes, from the one with all the notes lowered (A♭ minor) to the one with all the notes raised (A♯ minor), but then it each time represented a different section of a transposed fifteen-degree systema ametabolon. But the Greeks avoided, as we do now, the keys with seven alterations, and regarded the one with 6 sharps and that with 6 flats as enharmonically identical. The older theorists (and probably practical musicians also) were with justice opposed to the retuning of too many strings, from which certainly no good could come, and advised the non-retuning of the mese with its upper and lower octave, the paramese with its lower octave, and the hypate meson with its upper octave (advice which certainly presupposes that for the trite synemmenon there was a special string). With the notes thus left for retuning, the middle octave gave, instead of the Dorian mode, only the scales following:

e f♯ g a b c′ d′ e′ = Hypo-Dorian (1♯)
e f♯ g a b c′♯ d′ e′ = Phrygian (2♯s)
e f♯ g♯ a b c′♯ d′ e′ = Hypo-Phrygian (3♯s)
e f♯ g♯ a b c′♯ d′♯ e′ = Lydian (4♯s)

and with the additional use of the trite synemmenon:

e f g a b♭ c′ d′ e′ = mixo-Lydian.

But the Greek notation (v. under 117.) shows the old Greek fundamental scale was supposed to begin in the high notes, not with e but with f, which about amounts to this, that the Dorian scale e to e′ could not do without the upper semitone (leading-note) f; thus, the nine-stringed lyra (of which frequent mention is made), without changing the pitch of a note, had besides the Dorian mode (e to e′) a hypo-Lydian one:

f g a b c′ d′ e′ f′.

This by the introduction of the trite synemmenon became Lydian, which, to distinguish it from the one shown above, was termed high Lydian:

f g a b♭ c′ d′ e′ f′ (1♭).

Further transpositions of the synaphe (in spite of the objections of the older theorists) gave the following additional keys:

f g a ⌒b♭ c′ d′ ⌒e′♭ f′ = high hypo-Phrygian (hypo-Æolian) 2♭s

f g ⌒a♭ b♭ c′ d′ ⌒e′♭ f′ = high-Phrygian (Æolian) 3♭s

f g ⌒a♭ b♭ c′ ⌒d′♭ e′♭ f′ = high hyper-Dorian (hyper-Æolian, hypo Iastian) 4♭s

f⌒g♭ a♭ b♭ c ⌒d′♭ e′♭ f′ = high Dorian (Iastian) 5♭s

f⌒g♭ a♭ b♭⌒c′♭ d′♭ e′♭ f′ = high mixo-Lydian (hyper-Iastian) 6♭s.

To these finally, if in the octave e — e′ we alter the pitch of the notes properly speaking unalterable, we may add the following:

e f♯⌒ g♯ a♯⌒b c′♯⌒ d′♯⌒e′ = low hypo-Lydian

and the circle ends with two enharmonically identical:

e♯⌒f♯ g♯ a♯⌒b c′♯ d′♯ e′♯ } 6♯⌒s = 6♭ (high mixo-Lydian)
f g♭ a♭ b♭ c♭ d♭ e♭ f }

and f♭ g♭ a♭ b♭⌒c♭ d′♭ e′♭⌒f♭ } 7♭s = 5♯⌒s (low hypo-Lydian)
e f♯ g♯ a♯ b c′♯⌒ d′♯ e′ }

Consequently all names with the prefix *high* indicate tunings of the octave f — f′, and all with *low* prefixed indicate tunings of the octave e — e′. The latter are the oldest. The names Iastian and Æolian indicate generally, not particular octave species, but the repetition of better known ones at another pitch. If we understand the doctrine of dynamis and thesis rightly, it may appear doubtful to us whether (at least in the later time of the fully developed transposition scales) the octave species really had that independent importance which in the middle ages belonged to the similar ecclesiastical modes. If dynamis represents strength, value and importance, then the retuning of the thesis parhypate meson f to f♯⌒ really signifies nothing beyond the transposition of the Dorian octave from e — e′ to b — b′; that is, the mese is then *kata dynamin*, or the true mese is no longer *a* but *e*, and the *a* which remains mese according to thesis, has become paranete diezeugmenon according to dynamis. If we rightly assume, however, regarding the Greek notation, that the tone-region in which the melody chiefly moved was from about e to f′, it cannot certainly be denied that the octave species must indirectly

have obtained peculiar importance in as far as each transposition scale came into prominence through a part having, according to dynamis, different boundary notes (A minor from e to e', but E minor and B minor also from e to e'). The central point of the Greek conception of harmony was clearly the minor key (as the systema ametabolon is always a purely minor scale); but this does not exclude the supposition that the major was also comprehensible to them. In the Lydian octave species, the Greeks had a pure major scale, in the hypo-Lydian a major scale with an augmented fourth, and in the hypo-Phrygian one with a minor seventh. We may surely assume that, notwithstanding theory, the bright, passionate character of the major key was not hidden from them, and the dogmatical opinions of authors on this particular key might probably only confirm this view.

116. What relation is there now between this tone-system, apparently tolerably like our own, and the so-called tone-genera of the Greeks — the chromatic and enharmonic as differing from the diatonic?

They stand rather incomprehensible in Grecian theory elsewhere so clear. As in every other way of viewing the scale, so also in distinguishing the tone-genera, the Dorian tetrachord forms the starting point. Perhaps the antique theorists endeavoured to bring into one system all the notes which, for modulating, would require an altered pitch (which, as we know, even Ptolemy wished to see limited to the two middle notes of the Dorian tetrachord), but without interrupting, by any addition, the unchangeable order of four notes in the system of the fourth. In any case it is inexplicable to us now, how sensible music, worthy of the possessors of the previously explained complete system of the transposing scales, was possible with such an odd arrangement of the notes as the chromatic and enharmonic systems show. The normal diatonic pitch of the Dorian tetrachord:

$$\overbrace{e\ {}^{1}/_{2}\ f_{1}\ g_{1}}\ a$$

was, for instance, in the so-called *chromatic* tone-genus, altered so as to lower the pitch of the lichanos (g) a semitone:

$$\overbrace{e\ {}^{1}/_{2}\ f\ {}^{1}/_{2}\ g\flat_{1}}\ a$$

More singular still appears to us the (newer) *enharmonic*

genus in which the lichanos is again tuned down to about $^1/_4$ tone below the parhypate:

$$\overset{\frown}{e\ ^1/_4\ ^*\ ^1/_4\ f}\ \ a$$

To be sure, Plutarch relates, in accordance with Aristoxenus, that the original enharmonic genus ascribed to the elder Ulympos, consisted in the omission of the lichanos, thus:

$$\overset{\frown}{e\ \ f} \ldots a$$
$$^1/_2 \quad 2$$

But perhaps that traditional omission of the lichanos referred not to a Dorian scale at all, but to a Lydian or Phrygian one? Then, the antique enharmonic system would be nothing more than a reduction to the archaic scale of five degrees without steps of a semitone:

Phrygian d e . . g ‖ a b . . d
Lydian c d . . f ‖ g a . . c

The deeper meaning of this original scale had, to be sure, long become unintelligible. The interval of the semitone was not only known and understood, but it was believed to be indispensable. It was preferred therefore that another note should be wanting, rather than just the leading-note (either upper or lower). The later enharmonic system, however, divided, as said, the semitone into two quarter-tones. The three notes following one another at intervals of a quarter tone, were called the *pykna* (the compressed), and were expressed in the notation by three signs immediately following one another. The tuning down of the chromatic lichanos below the parhypate was termed *eklysis*, the contrary manipulation *spondeiasmos*, and the re-tuning from the enharmonic to the diatonic genus, *ekbole.**)

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*) It was only the enharmonic pitch that was defined as $^1/_4 + ^1/_4 + 2$ tones, for the chromatic as well as for the diatonic there were, on the contrary, many shades, namely:

the soft chroma	$^1/_3 + ^1/_3 + ^{11}/_6$
the hemiolian chroma	$^3/_8 + ^3/_8 + ^7/_4$
the toniæisian chroma	$^1/_2 + ^1/_2 + ^3/_2$
the soft diatonic	$^1/_2 + ^3/_4 + ^5/_4$
the hard diatonic	$^1/_2 + 1 + 1$

Later definitions (Didymus, about 25 B. C.) are:

enharmonic:	$^{31}/_{32} + ^{30}/_{31} + ^4/_5$
chromatic:	$^{15}/_{16} + ^{24}/_{25} + ^5/_6$
diatonic:	$^{15}/_{16} + ^9/_{10} + ^8/_9$

which Zarlino and Fogliani later followed, when they defined the major third as 4:5 and placed it among the consonances.

Since, among the different nations of the earth, we repeatedly find the diatonic scale as the foundation of all chromatic music, we can scarcely err in assuming, in spite of assurances to the contrary (at least in regard to the enharmonic system), for Greek music also, a similar process of development. And as, from all we know, the Greek ear felt in no wise differently from our own, it will be hard to see anything else in the chromatic notes of the tetrachord, than a means by which to modulate into another transposing scale. The tuning:

e f f♯ a | b c c♯ e

limited the power of the melody within the Dorian mode (A minor), but in compensation allowed of a very tolerable amount of movement in the hypo-Dorian (E minor):

e f♯ . . a b c . . e

and Phrygian:

e f♯ . . a b c♯ . . e

What new means the enharmonic pitch offered is really not to be seen here, unless one might suppose that the so-called quarter-tone was after all a little larger than the theorists had measured it (it is known that Aristoxenus, Greece's most ingenious musical theorist, would have nothing whatever to do with the mathematical determination of the intervals, but bade the ear alone be judge, perhaps a proof that it did not always agree). But then it would seem that besides the rather low-tuned parhypate, serving as upper note, one obtained in the lichanos a note which made with the mese, or nete, the interval of a pure major third. Even if the Grecian theorists knew nothing of the consonance of the third, it would still be strange if, to a people possessing a perfect scale of seven degrees, the importance of the third had not become clear to the ear at least.

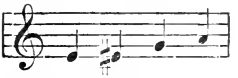
117. What was the character of the Greek notation?

It expressed pitch by means of letters, partly unaltered, partly mutilated and distorted in various ways. Besides an older notation for instrumental music *(krusis)*, the Greeks possessed a newer notation for singing *(lexis)*. The former was radically diatonic, as is evident from the fact that it expresses what we should call the raising or lowering of a note by varying the position of one and the same sign, which perhaps might remind one of the tuning-peg one turned in the kithara. What shape this certainly

much older instrumental notation might once have had, that is before the chromatic and later enharmonic systems, one can scarcely any longer imagine. In the time from which we have information concerning the notation, that is, from the second to the third century B. C., the old signification of the turning of a sign, to indicate the turning of the tuning-peg, had quite disappeared. In the table of scales, given by Alypius (4th century A. D., still agreeing with single notices by Ptolemy) the three forms of the same sign are not employed for different tunings of the same string, but rather for the three pykna of the enharmonic pitch, for example, in the Dorian mode thus:

enharmonic { Hypate meson ⌐ Parhypate meson ⌐ Lichanos meson ⌐

The chromatic pitch was shown by a stroke through the sign of the enharmonic lichanos. But in the diatonic pitch also, the two notes standing a semitone apart, were likewise shown by a different position of the same sign. It is about the same as if we were to represent the relationship of the leading note to another note, by deducing it from the same degree of the staff.

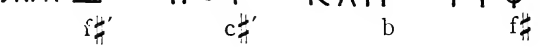


This appears to us illogical; to the Greeks it appeared clearer.

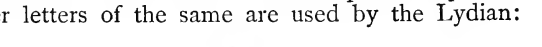
The vocal notation of the Greeks was from the first enharmonic and chromatic, and has therefore without doubt sprung from a later time. For the middle part of the entire tone-system, the enneachord e — f′, it disposes of a complete alphabet of undisfigured letters, read from the top down. As in the instrumental scale, the pykna of enharmonic pitch are expressed by closely connected signs. The Dorian scale, e — e′, appears enharmonically (chromatically) with the addition of the pyknon above the nete diezeugmenon, thus:

diezeugm.		synem.	meson
ΑΒΓ	ΚΛΜ	ΝΟΠ	ΧΨΩ
e′	b	a	e

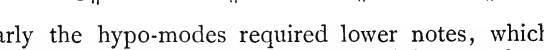
that is, this notation is clearly first used for the Dorian mode, and all the others therefore appear as transpositions of this. The Phrygian mode, which has the Dorian paramese for the mese, looks thus:



that is, it needs new signs in the high notes and takes for them the last letters of an alphabet upside down; further letters of the same are used by the Lydian:



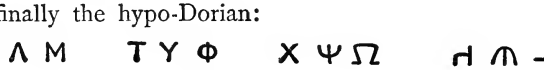
Similarly the hypo-modes required lower notes, which in like manner were expressed by mutilated letters; first the hypo-Lydian:



further the hypo-Phrygian:

and finally the hypo-Dorian:

The mixo-Lydian transposing scale seems to be of later date, as it requires notes in the upper register which, as octave notes of the notes of middle register, are expressed by the same signs with the addition of a stroke (′, like our once-marked a. etc.). These signs are immediately affixed to the letters required for the middle octave of the Lydian mode, so that two incomplete alphabets touch each other *A′ — O′* and the 6 inverted ones *L — Ϭ*):



Collectively the Greek notation appears thus:

The letters which have not the name of a note written under them, have the signification of the preceding letter, for example, *MN* and *Ξ* indicate the note b. For immovable notes (mese, paramese, nete, hypate), only the first of the signs of like meaning given here is used; as the parhypate, always the one next the hypate is used; as the enharmonic-chromatic lichanos, on the contrary, always the first (highest) of those of like meaning, but where there are three of like meaning (*MNΞ*), the middle one. For the diatonic

lichanos, the same sign serves that would also be chosen for immovable notes.

Our knowledge of the Greek notation is so complete that we can only regret that beyond a few fragments, of doubtful antiquity and questionable authenticity, nothing remains with which to turn it to practical use. Perhaps our exploring age may bring a change in this respect.

118. What do we know about the rhythm of Greek music?

First, to complete the explanation of the notation, it is to be remarked, that the duration of the notes was indicated by the following signs: ⎯ a long note of two beats, ⎯˘ a long note of three beats, ⎯⎯ a long note of four beats, ⎯⎯˘ a long note of five beats, notes without a sign or with the sign ˘ had the value of short notes of one beat. The sign for a rest was ʌ (leimma); the duration of the rest was indicated by ⎯˘ ⎯⎯ etc., placed over it. The rhythmical theory of the Greeks was common to both poetry and music, which is the more natural as instrumental music was not yet characteristically developed with them (as from about the 17th century with us) by a rapidity of passages, that distinguished it from the vocal music. As moderation in everything was the law of Grecian art, the musical rhythm of the Greeks shows restriction to the simplest means. But just in these simplest means it displays compared with ours a certain richness, inasmuch as, beside the twofold and threefold measures, a fivefold measure also played an important part. The rhythmical theory of the Greeks does not, like ours now, begin with a movement in equal beats and the subdivision and grouping of these, but at once makes certain rhythmical motives consisting of long notes and short ones the basis. These motives (the so-called poetical feet, *podes*) are:

the dactyl ⎯˘˘ } 4 time measure
the anapæst ˘˘⎯ }
the trochee ⎯˘ } 3 time
the iambus ˘⎯ }
the creticus (pæon) ⎯˘⎯ = 5 time.

The dactyls and anapæsts belonged to the equally balanced rhythmical genus (*Γένος ἴσον*), the trochees and iambi to that whose ratio was 1:2 (*Γένος διπλάσιον*), and the pæon was that of which the ratio was 2:3 (*Γένος ἡμιόλιον*). By dividing the long note into two short ones, the dactyl and

anapæst were changed into the proceleusmatic (⏑⏑⏑⏑), and the trochee and iambus into the tribrach (⏑⏑⏑); by contracting the two short notes the dactyl and anapæst were changed into spondees. The pæon could also be broken up into short notes only, or divided into two long unequal notes (2 : 3): nevertheless, the real foundation of theoretical opinion as of practical rhythm-making, still continued to be the before-mentioned motives, consisting of long and short notes, similar to something we shall find again in the 6 *modi* of the mensural theorists of the 12th to the 13th century. The *foot* of Greek rhythmical theory is, however, nothing else than the *measure* in modern rhythm; and just as we now distinguish between accented and unaccented *beats*, or parts of a bar, so also the Greeks distinguished between rising *(arsis)* and falling *(thesis)*; and they understood by thesis (fall of the foot in dancing, and in the choral singing in tragedy) the accented, and by arsis the unaccented beat (the middle ages reversed the meanings, understanding by thesis the fall, or decrease of the voice, and by arsis its rising, increased exertion, or strengthening; now, the expressions are again used in the same sense as by the ancients). Just as the modern musical science of form advances from a knowledge of the different kinds of time to the art of constructing periods by the union of several consecutive bars, so the Greeks arranged the feet in rhythmical series; and the greatest dactylic (anapæstic, spondaic) series, consisted of 16 time units (the unit of time was the *chronos protos*, the short note that could not be divided further), therefore 4 dactyls (dactylic tetrapod); the greatest iambic (trochaic) series was 18 units, that is three double iambi (an iambic trimeter, as, at first, an iambic dipod always comprised two iambi); and the greatest pæonian series was 25 units (pæonian pentapod). This strange arrangement arose from the idea that the greatest form of every rhythmical genus must be divisible in the same manner as the smallest (16 into 8+8, like 4 into 2+2; 18 into 2×6+1×6, like 3 into 2+1, and 25 into 3×5+2×5 like 5 into 3+2). Happily however, the rhythmical theory admits of so many combinations of these genera (for example iambic or trochaic tetrapods, or series of 4 iambics) that the musical practice was probably not too severely hindered by the above sum in arithmetic. A further result of this arrangement of the notes in higher

units was, that one assumed a higher chief *iktus* (accent) for each series than for the single foot. In the single foot, the long note was generally the bearer of the iktus, so that in this respect dactyls became identical with anapæsts, and trochees with iambi. For when an iambic series is arranged in bars like our music, it differs from the trochaic only in the first up-beat:

∪ | –́ ∪ | –́ ∪ | –́ ∪ | –́ and –́ ∪ | –́ ∪ | –́ ∪ | –́ ∪

and in fact they joined a catalectic (that is wanting the last unaccented beat) trochaic series with an iambic, or a catalectic dactylic with an anapæstic, the latter, for example, in hexameter:

–́ ∪ ∪ | –́ ∪ ∪ | –́ ‖ ∪ ∪ | –́ ∪ ∪ | –́ ∪ ∪ | –́ –

But the natural significance of the unaccented beat with regard to the following accented one, had not become clear to the Greek rhythmists; in the hexameter, in spite of the cæsura (end of a word, and break in the sense) after the long syllable of the third foot, they reckoned the two short syllables not with the following but with the preceding — i. e. continuing not in anapæsts, but in dactyls.

A uniformly continuous measure, such as seems indispensable in our music, the Greeks, indeed considered needless, and went as they pleased, from dactyls into trochees, or from iambics into anapæsts, or even into feet with five beats, when, to be sure, complicated rhythms like our triplets and groups of two or four notes may possibly have been used, for example:

– ∪ | – ∪ ∪ | – ∪ – ∧ = 

Our dotted rhythm (♩. ♪), they appear not to have known, as Aristoxenus categorically excludes the ratio three (3:1) from the list of practicable rhythms. Catalectic series, followed by others not corresponding at the beginning and more than complete (with an *anakrusis* or up-beat), were filled up at the end by rests.

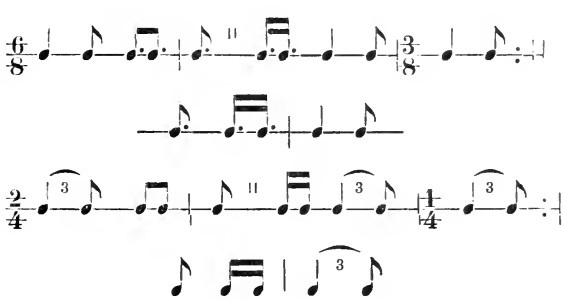
A conception of tempo also, was not foreign to the Greeks. Just as the older mensural theory opposed different kinds of movement, in which the value of each note was halved or doubled, to the *integer valor*, to the simple note-

value in diminution and augmentation, so also the Greeks distinguished a different *agoge* (tempo), in which the time-value of the single foot (for example, of a trochee) could be extended to the length of a dipod. Indeed, they even had special names for feet with double the usual length of syllables (greater spondee, *pæon epibatos*).

Of the manner in which several rhythmical series are combined to form strophes, the lyric *metra* give us the best conception. The most famous are:

1) The Sapphic: ⏑ – | – – | ⏑ ‖ ⏑ – | – ⏑ | ⏑ – (three times)
– ⏑ – | ⏑ – (fourth line)

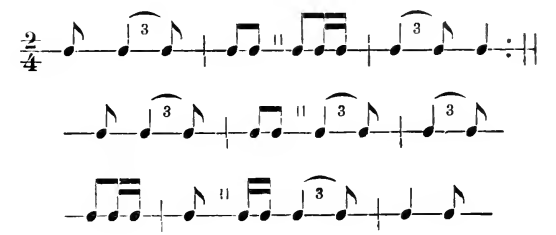
to be represented in our notation about as follows:



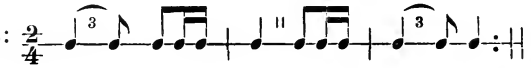
or:

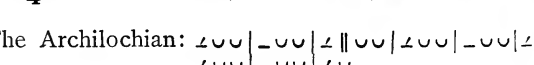
2) The Alcaic ⏑ | – ⏑ | ⏑ – ‖ – ⏑ ⏑ | ⏑ – | –
⏑ | – ⏑ | ⏑ – ‖ – ⏑ | ⏑ –
– ⏑ ⏑ | ⏑ ‖ ⏑ ⏑ | – ⏑ | ⏑ –

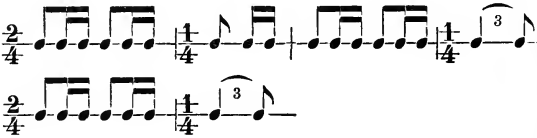
To be represented about as follows:



3) The Asclepiad: ⏑ – | – ⏑ ⏑ | ⏑ [⏑] ‖ ⏑ – ⏑ | – ⏑ | ⏑ [⏑],
repeated without alteration.

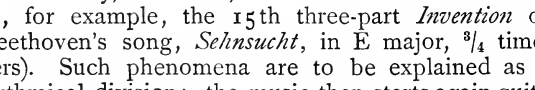
perhaps: 

4) The Archilochian: 

perhaps: 

What strikes us most is the frequent elision of a single foot, or, as we should say, of an unaccented beat. The end and new beginning hardly ever fit so that the time can be understood as proceeding smoothly. Something similar to this may, it is true, be found in modern music (compare, for example, the 15th three-part *Invention* of Bach, Beethoven's song, *Sehnsucht*, in E major, $^3/_4$ time, and others). Such phenomena are to be explained as a larger rhythmical division; the music then starts again quite independently.

Other strophes of still freer composition are rounded off by the symmetrical return of similar verses suitably arranged, as:



in the last of which cases the middle verse has no counterpart, but only the others grouped symmetrically round it.

119. Had the Romans an independently developed theory of music and notation?

No; it appears rather that the ancient musical cultivation of Italy was entirely Grecian. Even the musical performances in the times of the Republic and Empire were left chiefly to the Greeks. And although one might assume that, previous to Roman times, the Etruscans had not entirely neglected the cultivation of music, we nevertheless want all positive testimony concerning the particulars of modalities.

SIXTH CHAPTER.

TONE-SYSTEM AND NOTATION OF THE MIDDLE AGES.

120. Has the Western tone-system been developed from the Greek?

Yes; and as it appears indeed, through the singing in the services of the Christian church, first of all of the Byzantine church. It appears that, besides Hebrew Temple songs, the church accepted Greek hymns in the services, employing as their notation the tone-system and musical characters of the Greeks, but the latter probably in a simpler form. That they broke with the artificialities of the chromatic and later enharmonic systems was to be expected. The church required more energetic, healthier modes, such as the diatonic only could supply. And therefore, in place of the antique transposing scales, they composed one single diatonic scale from the fundamental notes (proslambanomenos or mese) of the chief transposing scales.

Dorian	proslambanomenos	A
Phrygian	„	B
Lydian	„	c♯
Mixo Lydian	„	d
Hypo-Dorian	Mese	e
Hypo-Phrygian	„	f♯
Hypo-Lydian	„	g♯
Hypo-mixo-Lydian	„	a

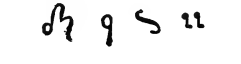
For these modes, they now made use of the first seven letters of the Greek alphabet (α β γ δ ε ζ η) and it is said, indeed, that St. Ambrose (4th century A. D.) introduced this practice; but this is doubtful, because in the West (St. Ambrose was bishop of Milan 374—397) a notation formed after this Greek notation with the seven letters of the alphabet (A B C D E F G), first became known much later (10th century). Nevertheless, it is very probable that in the Byzantine church a notation of this kind was in use much earlier. And so it happened that a major mode became the foundation scale of the new diatonic tone-system:

a b c♯ d e f♯ g♯ a
= α β γ δ ε ζ η ϑ.

The old signification of the notes was, however, for a long time preserved, indeed it has continued in the notation of the Greek church to the present time, in the so-called *martyriai;* that is, certain signs which inform us as to the mode to which a church song belongs. It appears that to get more easily accustomed to the tone-significance of the new alphabet, one noticed in which of the old transposition scales any note would be the fundamental note, and gave the hypo-modes the same signs as the chief modes: a δ signified Dorian, therefore; a φ Phrygian; a λ Lydian; and a μ mixo-Lydian; but the fundamental note of the hypo-Dorian was also indicated by δ and that of the hypo-Phrygian by φ, etc. thus:

a b c♯ d e f♯ g♯ a
δ φ λ μ δ φ λ μ

The present forms of these key-signatures are, to be sure, a little changed, although still to be recognized, namely:



We may at once observe here, to facilitate comprehension, that the Western alphabetical scale A B C D E F G, which was imitated from the first new Greek one, α β γ δ ε ζ η, and like this indicated at first, and for some time, a major scale, suffered a transposition later, whereby the letters obtained their present signification (A our gamut A, B our gamut B, c our tenor c, etc.); and similarly, the Greek church scale was also transposed, but in such a manner that the note originally called β was called α, that is, in the West, the signification in regard to the pitch of the notes was lowered a third, and in Byzantium it was raised a second.

A first result of that addition of the *martyriai* to the new method of notation was, that the names of notes indicated by them passed to the octave species which lay between the respective notes. The Byzantine musical author, Bryennius (14th century), has furnished us with names of scales, which coincide as little with the antique scales as with the mediæval Western ones, but which introduce us to a middle stage

about which no further information exists (instead of the A, which in the antique notation of the Dorian proslambanomenos would be c, we write — expressing the fundamental scale by the simplest means — the C major scale):

c d e⌢f g a b⌢c′ = Dorian
d e⌢f g a b⌢c′ d′ = Phrygian.
e⌢f g a b⌢c′ d′ e′ = Lydian
f g a b⌢c d′ e′⌢f′ = mixo-Lydian
g a b⌢c d′ e′⌢f′ g′ = hypermixo-Lydian
G A B⌢c d e⌢f g = hypo-Dorian
A B⌢c d e⌢f g a = hypo-Phrygian
B⌢c d e⌢f g a b = hypo-Lydian

Of these scales, four attained to prominent importance, as those in which the church songs were written, namely, the second, third, fourth and fifth, in the above enumeration. They were called the church modes *(echoi)* in following order:

g — g′ = 1st Church mode (ἦχος α′)
f — f′ = 2nd „ „ („ β′)
e — e′ = 3rd „ „ („ γ′)
d — d′ = 4th „ „ („ δ′).

To these chief modes *(echoi kyrioi)* four derived ones were added, after the manner of the hypo-modes, as they are produced by taking away the upper half (from the fourth upwards) and making it the lower one:

c d e f g a b c′ d′ e′ f′ g′

These were called plagal modes (πλάγιοι):

c — c′ = 1st plagal mode (α′ πλάγ.)
B — b = 2nd „ „ (β′ „)
A — a = 3rd „ „ (γ′ „)
G — g = 4th „ „ (δ′ „).

It is to be observed, that here G is the lowest note required, the same note which in the West appears as *Γ* (v. 123).

The modes g — g′, f — f′, e — e′ and d — d′ now remained as the chief church modes, and only one change

more was made, namely, they were numbered in the contrary order, the plagal forms being placed not a fifth but a fourth lower than the *kyrioi*. Whether this order (still preserved in the Greek church) was the result of a reaction from the West (where we shall find the same order early developed), or whether it originated in the Byzantine church must be left undetermined. The newer order is:

d e f g a b c′ d′ = 1st Church mode (ἦχος α′ κύριος)
e f g a b c′ d′ e′ = 2nd „ „ („ β′ „)
f g a b c′ d′ e′ f′ = 3rd „ „ („ γ′ „)
g a b c′ d′ e′ f′ g′ = 4th „ „ („ δ′ „)

and

A B c d e f g a = 1st Plagal Mode (α′ πλάγιος)
B c d e f g a b = 2nd „ „ (β′ „)
c d e f g a b c′ = 3rd „ „ (γ′ „)
d e f g a b c′ d′ = 4th „ „ (δ′ „).

The above mentioned transposition of the names of the notes, consisting of the first seven letters of the alphabet, attached itself to this system, the favorite first church mode being taken as the fundamental scale:

d e f g a b c′ d′
= α β γ δ ε ζ η α

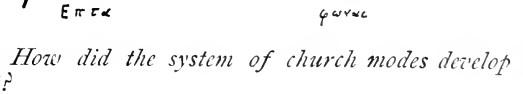
These simple alphabetical names are, however, easily hidden in a kind of solmisation syllable:

πA Bov Γα Δι κE Ζω νH.

As before, however, the alphabetical notes have the old *martyriai* associated with them; and these have maintained their place unchanged, in spite of all the transpositions of the names of both notes and scales. Yes, although in the Greek as well as in the Roman church, the scale d—d′ is called the Dorian, e—e′ the Phrygian, f—f′ the Lydian, and g—g′ the mixo-Lydian, yet, the *c* and *g* always receive the *martyria* δ, which characterizes them as chief pillars of the Dorian mode; *d* and *a* always take φ (Phrygian); *e* and *b* λ (Lydian) and *f* and *c* (the latter of course only where it has not δ) take μ (mixo-Lydian).

To conclude our exposition of the Byzantine tone-system, we may, for the sake of completeness, observe concerning the Byzantine liturgic notation, that it is very complicated, and, like the neumes of the Western church,

cannot be deciphered with certainty, although the old notation ascribed to Johannes Damascenus (700—760) was, in the 18th century greatly simplified by Gregorius Lampadarius and Chrysanthus of Madytos. The above indicated alphabetical signs (with the initial letters of the solmisation syllables last mentioned, that is, *π B Γ Δ ε Z ν* together with the *martyriai* belonging to them) appear only at the beginning of melodies and in interludes and cadences, when they determine the key as well as the absolute pitch of all the remaining note-signs. The latter partly consist of interval signs (*σημεῖα ποσότητος*), showing the number of degrees up or down as well as the rising or falling itself; partly they were rhythmical signs (*σημεῖα ποιότητος*), partly signs for embellishments (*σημεῖα χειρονομίας*); most of the signs are double, and consist of body (*σῶμα*) and spirit (*πνεῦμα*). A short example taken from Philoxenus (*Λεξικόν*, 1868) may show the external appearance of the Byzantine notation:



121. How did the system of church modes develop in the West?

At a time when in Byzantium the antique tone system had probably long been set aside or (in the manner described in 120) improved, the theory of the octave species, transposing scales and tone-genera, was in the West left unchanged. To be sure, the number of those who understood Greek soon diminished, but as a classic Latin exposition of the antique system was at hand in the five books, *De musica*, of Boetius (475—526), nothing was more natural than that the monks should not only have held to the old system as long as they had no other, but that they should have mixed it up in the most confused manner with the new one, presumably brought from the Eastern Empire. The first Western writer who mentions the church modes is Flaccius Alcuin (8th century). As the church modes appear immediately with Greek names: — *protus*, *deuterus*, *tritus*, *tetartus*, and *plaga* or *plagis proti*, *deuteri*, *triti*, *tetarti*, the assumption that they came from Byzantium westward, is not to be set aside. And the order in which the West accepted them, and which reckons them from *d* upwards

(d e f g a b c′ d′ = 1st church mode), being the newer one, one might thence assume that the different method of arranging them given us by Bryennius (who makes g a b c′ d′ e′ f′ g′ the first church mode and takes the plagal modes a fifth instead of a fourth lower), was already replaced by the new one as early as the 8th century. Moreover, neither Alcuin nor yet Aurelianus Reomensis and Remigius of Auxerre (both of the 9th century), designate the church modes by names borrowed from the antique scales, but rather, these authors speak of the antique scales without in any way connecting them with the church modes (in which they probably copied Boetius). It is only in the 10th century (in pseudo-Notker and pseudo-Hucbald), that the practice, ever since retained and accepted by the Byzantine church, of designating the church modes by the names of the antique octave species (Dorian etc.) first appears, but with a confusion of names to be explained by a passage of Ptolemy having been misunderstood. This author's statement, that the Phrygian mode lay one degree higher than the Dorian, the Lydian one degree higher than the Phrygian, and the mixo-Lydian one degree higher than the Lydian (which — cf. page 85, — for the transposing scales is correct), they erroneously referred to the octave species, the identity of which with the church modes had been rightly recognized, and they therefore designated the four chief (authentic) church modes by the names of the four chief octave species of the Greeks, in the following order:

Authentus protus = d e f g a b c′ d′ = Dorius
„ deuterus = e f g a b c′ d′ e′ = Phrygius
„ tritus = f g a b c′ d′ e′ f′ = Lydius
„ tetartus = g a b c′ d′ e′ f′ g′ = Mixo-Lydius

and the four plagal ones:

Plaga proti = A B c d e f g a = Hypodorius
„ deuteri = B c d e f g a b = Hypophrygius
„ triti = c d e f g a b c′ = Hypolydius
„ tetarti = d e f g a b c′ d′ = Hypomixolydius.

In a consecutive enumeration of the church modes, the corresponding plagal mode was always added after the authentic one, thus:

I. Dorius, II. Hypodorius, III. Phrygius, IV. Hypo-

phrygius, V. Lydius, VI. Hypolydius, VII. Mixolydius, VIII. Hypomixolydius.

It is to be observed, that the octave was not divided here, as in the antique scale, into

Fifth (above) and
Fourth (below)

but on the contrary into

Fourth (above) and
Fifth (below);

that is, that while the antique Dorian scale divides into

e f g a and a b c′ d′ e′

the octave species now called the Phrygian church mode, to outward appearance the same, divides into

e f g a b and b c′ d′ e′.

Here as well as there, the reverse position of the two sections of the scale, gives the subordinate scale designated by hypo; but it is easy to see that the terms chief mode and subordinate mode have exchanged *rôles*. All the plagal church modes are to be understood like the chief modes of the Ancients (the central point of which, the mese, was the fourth of the lowest note) and conversely, the authentic like the hypo-modes of the Ancients:

Antique:	Mediæval:
Dorian	Hypo-Dorian
A B c d **e** f g **a** b c′ d′ e	A B c **d** e f g **a** b c′ d′
Hypo-Dorian	Dorian
Phrygian	Hypo-Phrygian
G A B c **d** e f **g** a b c′ d′	B c d **e** f g a **b** c′ d′ e′
Hypo-Phrygian	Phrygian
Lydian	Hypo-Lydian
F G A B **c** d e **f** g a b c′	c d e **f** g a b **c′** d′ e′ f′
Hypo-Lydian	Lydian
Mixo-Lydian	Hypo-mixo-Lydian
E F G A **B** c d **e** f g a b	d e f **g** a b c′ **d′** e′ f′ g
Hypo-mixo-Lydian	Mixo-Lydian

For completeness' sake we at once remark here, that towards the end of the mediæval age of musical history, on the threshold of modern times, there were added, to the 8 old church modes, two new modes with their plagal ones, the names of which were borrowed from the latest transposing scales of the Ancients: viz. the Iastian and Æolian with their hypo-modes:

hypo-Ionian	hypo-Æolian
G A B **c** d e f **g** a b c′	E F G **A** B c d **e** f g a
Ionian	Æolian

the former answering to our modern major scale, the latter to our minor.

122. What kind of notation had the West in the middle ages?

Before the appearance of the letter notation with A B C D E F G, already mentioned in connection with the Byzantine musical characters, the West appears to have had only the notation known by the name of *neumes*. Whether this is not also finally to be referred to Byzantium, must remain an open question. The name is in any case Greek, whether the *neuma* (singular, feminine) be traced to *πνεῦμα*, the spirit, or to *νεῦμα*, the sign (both neuter). The names also of many neumes are Greek; for example *epiphonus*, *cephalicus* and *quilisma*, the latter of which certainly points to *κύλισμα* (the barrel) an ordinary trill-like embellishment, also common in the Byzantine liturgical notation before sections. Since Johannes Damascenus (about 700—760), already reformed the Byzantine notation, said to have been invented in the fourth century by St. Ephrem, it might surely be supposed that the neume notation, which, it appears, was already in use in the Western churches in the time of Pope Gregory I. (died 604), was more like the Byzantine notation in use before the time of Johannes Damascenus, than like that which he reformed and which is known to us. That the neumes were called *nota Romana* (Roman notation), proves nothing, after all, as to its origin, only at most that this kind of notation spread from Rome through the West. The signs used in that oldest Byzantine notation are (according to Burney):

With these, to be sure, the elements of the Western neume notation have the greatest resemblance:

Virga

Jacens

Punctus

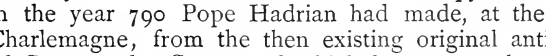

Clinis (Flexa)


Pes (Podatus, Epiphonus)

Pes flexus (Torculus, Cephalicus)


Pes resupinus (Porrectus).

Unfortunately, the meaning of the neumes can no longer be deciphered with certainty. All that we know beyond doubt is, that the *rising and falling of the melody was made directly perceptible by the signs*, a superiority of this notation which rendered it worthy to obtain lasting distinction in a more improved form, and to become an essential element of our present notation. The *virga*, in comparison with the *jacens* or *punctus*, denotes a higher tone, the *clinis* denotes a higher and a lower, the *pes* a lower and a higher, the *pes flexus* a rising and falling again, and the *pes resupinus* falling and rising again. The *quilisma*, indicating the repeated alternation of neighbouring notes, was about equal to our sign for the shake (~~). A short example from the antiphonary of St. Gall, said to be a true copy of that which in the year 790 Pope Hadrian had made, at the wish of Charlemagne, from the then existing original antiphonary of Gregory the Great, and which he sent to the emperor, may give an illustration of the old neume notation in its oldest Roman form:



The neat forms of these oldest neumes, which have been compared to flies' feet, grew coarser later, assuming according to time and place many different, yet in the main coinciding, forms, the most famous of which, because most contrasting with the originals, was the so-called nail or

horse-shoe notation, which received its name from the forms of the virga and clinis

If the neumes ever gave the intervals of ascent or descent exactly, then the knowledge of the necessary rules was indeed early lost. Hucbald (10th century) already complains that the neumes were only an uncertain guide, and a mere help to the memory *(rememorationis subsidium)* rather than a real notation; and Johannes Cotton (10th—11th century) says expressly, that of the pre-Guidonian neumes, the virgula, the podatus and clinis indicate no interval either of ascent or descent with certainty. It is not surprising, therefore, that many attempts were made to find a more definite notation. But these took place at a time when, as it appears, the Byzantine notation of the diatonic scale with the first letters of the Greek alphabet, became known and imitated, and they consequently soon vanished again before this thoroughly simple and practical manner of notation.

123. When did the Latin letter notation appear?

As it seems, in the 10th century; at least nothing is yet known, to prove its existence further back. It is an erroneous assumption that Gregory the Great (died 604) introduced the Latin letter notation. The antiphonary which the Pope made a guide for the choral services in the Western churches, was not a letter notation, but neumes. Equally erroneous is the assumption that Boetius replaced the Greek notation by a Latin one. In those passages in which Boetius explains the intervals of the monochord, letters are used only as mathematicians always use them, to indicate points, but not with any note-signification whatever. The designation, Notation of Boetius (*Notation Boëtienne)* is therefore altogether unhistoric and to be rejected. The oldest known documents in which this notation is used are about measures of monochords and organ-pipes; two of these (in the old high-German language) are ascribed to Notker Balbulus (died 912), one to Hucbald (died about 930), etc. An enumeration of the church

modes, by Notker, also makes use of this notation. It runs thus:

Y uuizin darmite daz an demo sange dero stimmo echert siben uuehsela sint, die Virgilius heizet ‚septem discrimina vocum' unde diu ahtode in qualitate diuselba ist so diu erista. Fone diu sint an dero lirun unde an dero rotun io siben sieten und sibene gelicho geuuerbet. Pe diune gat ouch an dero organun das alphabetum nieht furder ane ze siben buohstaben dien eristen **A B C D E F G.** Tero sibeno sint fiere ih meino **B C D E** allero sango uzlaza. Tiu des eristen toni unde des anderen sint tiu habent uzlaz an demo **B.** Tiu des dritten unde des fierden sint an demo **C.** Tiu des finften unde des sehsten an demo **D.** Tiu des sibenden unde des ahtoden an demo **E.** Unde uuan da sango lih uuallon mag fone sinemo uzlaze nider unz de demo finften buohstabe unde uf unz ze demo niunden, so daz iz trizene uberloufe, also diu antiphona tuot an demo eristen tono: Cum fabricator mundi. Bediu sint obenan zu zesezzenne des kemachen alphabeti sehse di ersten **A B C D E F** unde nidenan dri die afterosten **E F G.** Tanne sint iro sehszene so uuio dien alten musicis finfzen buohstabo unde finfzen seiton gnuoge duohti.

Three things are here to be particularly observed: 1st. Notker as yet knows nothing of the designation of the church modes by the names of the antique octave species, but simply numbers them — 1st to 8th.

2ndly. For every church mode including its plagal, the compass of a 12th is required, namely, from the fundamental note, a fifth (l) downwards and a ninth upwards, so that the total compass amounts to two octaves and a tone.

3rdly. The fundamental note of the first church mode is marked B, so that A would have the meaning of our (tenor) c:

Notker's reference to different musical instruments (lyra, rotta, organ) shows that for those instruments, this kind of notation was at that time already in use. It is possible that the custom of writing the names of the notes on the organ keys (cf. 59) was already established before

the instrument became known in the West, and that it was brought hither with it from Greece. In any case it is easy to understand, that this simple and sure notation quickly won favour, since the neume notation only appeared sufficient as a help to the memory, and not for newly invented song. As early as the 10th century this Latin letter notation underwent a decided transformation, namely the already indicated transposition of its meaning in regard to pitch. As we first meet with this in the *Dialogus de musica* by the learned Abbot Odo of Clugny (who died in 942), it is very possible that he himself effected this transformation, which consists in nothing else than the application of the new method of notation to the antique fifteen-degree system from proslambanomenos to nete hyperboleon. Odo, for instance, gave the mese and both its octaves (the boundary notes of the system) the sign A, but distinguished the notes of the second octave from those of the first by the choice of smaller letters (minuscula); and as higher notes were also used in his time, he chose for these, Greek letters, and the only one of the lower notes still required (great G) received as its sign a Greek letter (*Γ*). But Odo recognized the indispensability of the trite synemmenon and distinguished this from the paramese by a different form of the b (square ♮ [called *b durum* or *b quadrum*, *quadratum*] for the paramese, round b [b rotundum or molle] for the trite synemmenon). His entire system appears thus:

Γ A B C D E F G a b ♮ c d e f g *α* *β* ♮ *ϰ* *Λ*

our: G A B c d e f g a b♭ b c′ d′ e′ f′ g′ a′ b′♭ b′ c″ d″

that is, in the upper octave also, b♭ was distinguished from b, and the latter from the ♮ of the middle octave by doubling the sign, a principle which the nearest descendants of Odo generally preferred, instead of the Greek letters, for the highest notes:

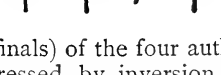
a b ♮ c d
a b ♮ . c d

In other respects the original signification of the note-letters, which we shall call *organ notation*, continued for centuries beside Odo's newer one, which, however, soon

became the more general one. Odo's division of the octave, viz., that of always starting the new form of letter at a, continued to modern times — for a time, indeed, beside our present one, which makes the octave begin at c (first used in 1619, in Michael Prætorius' *Syntagma musicum*), as well as an intermediate one which uses the double form of the b for dividing (G A B ♮ c d . . .). For a time merely, in connection with the temporary compass of the organ, the following divisions of the octave were used, viz. F — E, f — e, and ff — ee. But those who, after it had become known that Odo had applied his improved method of notation to the antique system, still held to the old organ notation, took notice of the double form of the b, as they gave to the G of their notation, which coincides with the Odonian b, a double form, viz. great G for ♮ and little g (g minus) for b♭. An s (= synemmenon) also appears for this note. Moreover, here and there, they used the alphabet further than to g; then h had the same signification as (little) a, i was equal to b, etc. as far as p = a′. This kind of notation has been frequently called of late the notation of Boetius (Notation Boétienne) on the erroneous assumption that Boetius had invented it. The sign of the trite synemmenon (b♮) in this notation was a recumbent i (·–).

124. What was the nature of Hucbald's attempt to find a notation which should be distinguished from the neumes by greater definiteness?

Hucbald, or more correctly pseudo-Hucbald (for the manuscript, *Musica enchiriadis*, in which these attempts are made, dates back perhaps a hundred years before Hucbald, who died in 930) still knew the old Greek notation (probably from the writings of Boetius), and pointed out its greater definiteness compared with the uncertain signification of the neumes. He even proposed indicating ascent and descent by placing Greek letters over the neumes. Finally, however, he proposed a notation of his own, the derivation of which from the antique tetrachordal-system is evident; for instance, he chose the signs:



for the four tonics (finals) of the four authentic church modes (d e f g), and expressed by inversion (in this also copy-

ing from the Greek notation) the lower fourths, upper fifths and octaves of these four notes; for instance, for the chief notes (tonic and fifth) of the first and second church modes he chose:

This, at least, is the form lately given to the pseudo-Hucbald division of the tetrachord. Unfortunately, however, there is only too much reason for believing that Hucbald's principle was not quite so sensible, and his nearest contemporaries, foremost Hermannus Contractus, whom we shall consider presently, already find fault with his notation just because it marks not the octave but the ninth with the same sign. In other words, Hucbald distinguished the following tetrachords:

G A B c	d e f g	a b c′ d′	e′ f′ g′ a	b′ c″
Graves	Finales	Superiores	Excellentes	Residuæ

of which only the two middle ones give the semitone in the same position, and he therefore marked with the above signs not *A d a d′ a′*, but *G d a e b′*. However, his notation could not last, because three of the fundamental signs (v. above) were far too much alike. An arrangement of the tetrachords which would make Hucbald's notation appear more logical, namely:

G A B c	d e f g ‖	a b c′ d′	e′ f′ g′ ‖	a′ b
Graves	Finales	Superiores	Excellentes	

was proposed by the abbot Wilhelm von Hirschau (about 1068), but without any reference to Hucbald's notation, so that the attempt to credit Hucbald with this distinction must be resisted.

125. What was the nature of the notation of Hermannus Contractus?

Hermann, Count Vehringen, surnamed from his lameness Contractus, a monk in the monastery of Reichenau (died 1054), dissatisfied with the neumes as well as with the

notation of the pseudo-Hucbald, and apparently quite unacquainted with the Latin letter-notation, put forward a notation unique of its kind (at least nothing similar existed except in the Byzantine notation, combined with other elements), which made that which was wanting in the neumes its principal point, viz., the exact definition of the intervals in regard to pitch. The signs are:

E = Unison (equat)
S = semitone (semitonium)
T = tone (tonus)
TS = minor third (tonus cum semitonio)
TT = major third (= ditonus)
D = fourth (= diatessaron)
Δ = fifth (= diapente)
ΔS = minor sixth (diapente cum semitonio)
ΔT = major sixth (diapente cum tono)
ΔD = octave (diapente cum diatessaron)

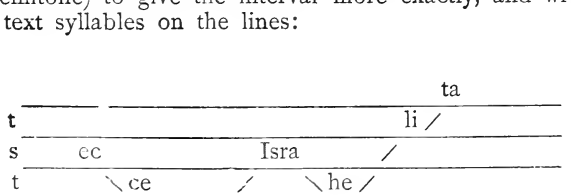
If a part ascended by one of these intervals, the simple sign sufficed, if it descended similarly, a point was added to the part ($\dot{\Delta}$.) Of course, the pitch had to be determined in some way at the beginning, probably by means of a letter indicating the church mode. These letters, which call to mind the *martyriai* in the Byzantine notation, were also regularly used at the beginning, in the neume notation. They are:

a = 1st Church mode
e = 2nd „ „
i = 3rd „ „
o = 4th „ „
u = 5th „ „
η = 6th „ „
y = 7th „ „
ω = 8th „ „

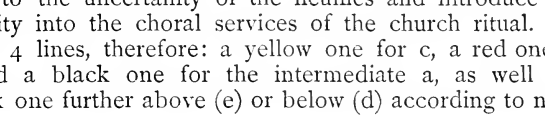
Hermann's notation became rather extensively used, although it suffers from the great defect, that a single mistake in the notation must disturb the entire melody. To judge from some manuscripts in the Munich library, it was used also in combination with the neumes. As observed above, all these attempts came too late, as a new foundation had been obtained in the Latin letter-notation, the amalgamation of which with the neumes was destined to become the notation of the world.

126. What services has Guido d'Arezzo rendered to notation?

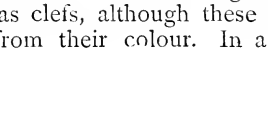
The name of the Benedictine monk, Guido d'Arezzo (Guido Aretinus, born 995, died about 1050) is, for two reasons, famous in musical history; first, as the inventor and founder of solmisation, and secondly as the founder of the present notation. As often happens, besides these truly important services many others have likewise been ascribed to him, for example the invention of the pianoforte, and finally, indeed, music generally. Calm research has denied him one thing after another, and, at last, even questioned everything, hardly with justice. The high esteem in which Guido's name was held by all the writers of his own time, and of the time immediately following, guarantees him the laurel for the above mentioned innovations. Guido became the founder of our notation by combining the Latin letter-notation with that of the neumes in a thoroughly simple manner, but not at all in the way in which pseudo-Hucbald wrote Greek signs over the neumes, or in which (also about Guido's time) the notation of Hermannus Contractus was combined with the neumes: Guido's method was rather to mark spaces, by means of lines placed one above another, which should have the same signification as to pitch as the letters placed at the beginning of them; and he then put in the neumes between the lines. Something similar had, it is true, been attempted by Hucbald — *not* by pseudo-Hucbald, but by the author of the *Harmonica institutio*, the monk Hucbald, in the monastery of St. Amand, in Flanders (died about 930), when he represented the position of the notes with regard to pitch by lines placed one above another, put between the lines at their commencement the signs *t* (tone) and *s* (semitone) to give the interval more exactly, and wrote the text syllables on the lines:



but he did not do this in order to set up a new notation, but only to make the difference between the tone and semitone interval clearer. Pseudo-Hucbald, that is the author of the first work on the *organum* (No. 148), also ascribed to Hucbald though written 100 years after his time, makes similar attempts, but places at the beginning of the lines, besides t and s, his own above described (124) particular note-signs. Indeed, an old manuscript of the *Musica enchiriadis*, even places dots (short notes) and hooks (virgulae, for long notes) on the lines. To this must be added, that a chronicle of the monastery of Corbie, dating from the end of the 10th century, mentions that about the year 986 a beginning had already been made in regulating the distance of the neumes from one another by means of lines. Thus Guido's service is finally reduced to having brought order and method into these various attempts, and to having assigned to the spaces, as well as to the lines, a special signification in regard to pitch, so that with half the number of lines the same result was obtained. Guido's object was to put an end to the uncertainty of the neumes and introduce uniformity into the choral services of the church ritual. He drew 4 lines, therefore: a yellow one for c, a red one for f and a black one for the intermediate a, as well as a black one further above (e) or below (d) according to need:

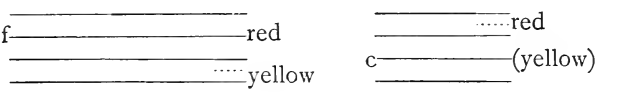


Guido, according to an antiphonary of the 11th century (by St. Evrould), appears to have even prefixed the note-letters as clefs to the lines not marked by their colour:

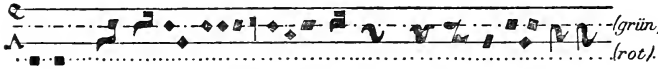


Later, however, it became a general custom to prefix only f and c as clefs, although these lines were already recognizable from their colour. In addition to coloured lines,

one also had coloured spaces, as soon as, for instance, an f or c happened to fall between the lines:

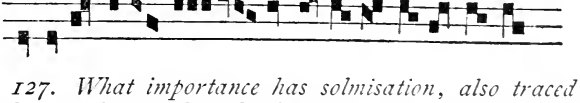


And then one even wrote the clef-letters also in the spaces. When Guido applied the neumes to the staff (always of four lines) he transformed them in such a way that a thickening of the head or stroke indicated exactly where the note should stand. A sample taken from the antiphonary of St. Evrould looks thus:



The success of Guido's innovation was both complete and exceedingly rapid, as is to be seen from the fact that in 1026 Pope John XIX. called Guido to Rome that he might himself be convinced of the excellence of his method of notation. The Pope appears then to have ordered all the churches and monasteries to accept Guido's improvement, that is, that in place of the antiphonaries with neumes only, they should have others, made according to the pattern which Guido had produced, in which alterations of pitch should be regulated exactly by means of lines and clef-signatures. Variously as the neumes were eventually placed upon the lines (those without lines now very quickly disappeared entirely), both the thickened notation resembling the nail or horse-shoe, and the still very neat one like flies' feet have, nevertheless, this in common, that they indicate plainly on which line or space a note should fall. This requirement was the most completely satisfied by the *nota quadrata* or *nota quadriquarta* which for the actual note always used a square, but, where the old neumes had several ascending or descending points, the square was placed obliquely; and, in the so-called oblique note (figura obliqua) of the shape of a thick oblique stroke, a sign indicating two notes (one by its beginning and one by its end) was preserved. It is

therefore merely a difference in calligraphy if the above example now appears thus:



127. What importance has solmisation, also traced to Guido, in the further development of the mediæval tone-system?

It is not quite determined whether Guido himself taught solmisation in the sense in which it certainly was taught under his name in the next generation, and as it remained for 500 years. Guido himself relates, in a letter to the monk Michael (*De ignoto cantu*), that in order to give his pupils a ready knowledge of the tone and semitone intervals, he used, as an aid to memory, the hymn to St. John, every succeeding line in which begins a degree higher:

UT queant laxis
REsonare fibris
MIra tuorum
FAmuli gestorum
SOLve polluti
LAbii reatum
Sancte Johannes.

One can scarcely err in assuming that even in Guido's life-time, the constant pointing to the syllables printed here in capital letters, gave them the significance of notes, or rather of intervals or degrees of the scale. Here *mi* to *fa* is the only semitone. The name *mi-fa* is therefore soon obtained to indicate the step of a semitone. But the so called *mutation*, that is, the transposition of the names of the degrees, so that *mi-fa* might not only indicate e f (for which it is employed in the above hymn) but also *b c* and *a* $b^{\flat}$ (the only three semitones, as we know, in the tone-system of that time) doubtless developed in Guido's day, if not in the most perfect form. In any case, in the 11th century, we find the three similarly constructed scales of six degrees, fully developed:

1. c d e f g a
   ut re mi fa sol la (Hexachordum naturale)

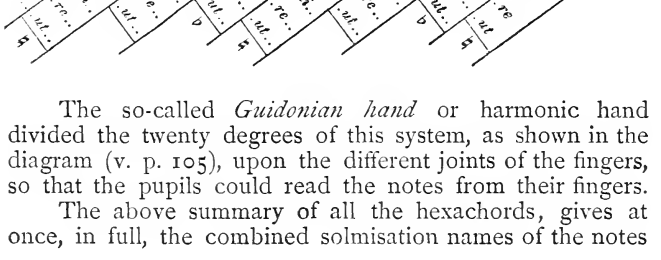
2. f g a b♭ c d
ut re mi fa sol la (Hexachordum molle)

3. g a b c d e
ut re mi fa sol la (Hexachordum durum)

Perhaps it is not accidental that such a hexachord appears as the union of the three different possible groups of fourths:

$$1 + 1 + {}^1/_2 \qquad 1 + {}^1/_2 + 1 \qquad {}^1/_2 + 1 + 1.$$

In any case, the augmented fourth, consisting entirely of tones (f — b), is intentionally excluded. Every appearance of an augmented fourth or a diminished fifth, in Guido's system denotes the passage from one hexachord into another. If, for instance, from *a* preceded by e — g, we passed to b♭ (b rotundum, b molle), the *a* was no longer *la* — since it is altogether impossible to go beyond *la* — but *mi*, the semitone-step being always expressed by mi-fa: therefore the progression *g a* was not called sol-la, but sol-mi (hence the name solmisation). In passing over *a* to *b* (b durum, quadratum) *b* became *mi*, and *a*, therefore, *re*. The compass of the tone-system in Guido's time was from great *G* (*Γ*) to twice-marked *e* (e e):

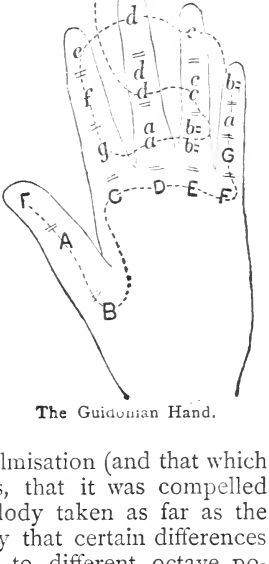


The so-called *Guidonian hand* or harmonic hand divided the twenty degrees of this system, as shown in the diagram (v. p. 105), upon the different joints of the fingers, so that the pupils could read the notes from their fingers.

The above summary of all the hexachords, gives at once, in full, the combined solmisation names of the notes

as they were used in the next generation (the *hexachorda dura* have the sign ♮, the *hexachorda mollia* the sign ♭ and the *naturalia* have no sign annexed). So, for instance, our small c would be equal to C fa-ut, once-marked $c = c$ sol-fa-ut and twice-marked $c = \frac{c}{c}$ sol-fa. This complicated method of writing the notes, continued to be used in theoretical works into the last century. In France a rather different order of the solmisation names after the note-letters, proposed by Loys Bourgeois in the 16th century came into use: viz.:

F	G	A	B	C	D	E
ut	re	mi	fa	sol	la	..
fa	sol	la	..	ut	re	mi
..	ut	re	mi	fa	sol	la



The Guidonian Hand.

therefore, F ut fa, instead of F fa ut, and so on. The nature of solmisation consists in an exposition of the logical functions of the notes in a mode, and the science of the transposition of the hexachords *(mutation)* is an introduction to the understanding of modulation. In fact one distinguished henceforth three kinds of singing, viz., the *cantus naturalis*, *cantus durus* and the *cantus mollis*, according as a melody kept within the compass of one or another hexachord or made a mutation from one into another. The fault of solmisation (and that which ultimately proved fatal to it) was, that it was compelled to see a modulation in every melody taken as far as the octave. Although we cannot deny that certain differences in the melodic effect are peculiar to different octave positions, so that transition into another octave seems like transition into another tone-region, yet we regard it as something quite different from a transition, for intance, from C major into G major. In a solmisation sense, the transition, for instance, from the tone-region of middle c into that of its octave above, is only possible

indirectly through the tone-region of g, as an intermediate stage; that is to say, therefore, one modulates, so to speak, out of C major into C major through G major. In addition to this, it is not very easy to comprehend how one succeeded with, for instance, the Phrygian church mode, which even in its smallest compass (e — c′) fitted into no hexachord. The great historical importance of the science of solmisation is, that it helped the inflexible diatonic systems of the church modes towards freer development, so that finally our enharmonic-chromatic system could be developed from it.

128. How did the accidentals come into notation?

As it appears, even Gregorian song did not dispense entirely with modulation, at least, all antiphonaries which in Guidonian manner are placed upon lines, agree in indicating now *b molle* and now *b durum*; it appears therefore, that the diatonic system of the church modes admitted at least the single exception which the antique *systema metabolon* brought with it, namely, the variability of the degree above the mese (paramese = b, or trite synemmenon = b♭). Just as the Latin letter-notation adopted a double sign (b and ♮, G and g, i and ·ı·) for this double form, so also Guido's letter-notation, abbreviated by the lines, could not, when combined with the neumes, dispense with this distinction, and Guido found the simple means of including *b molle* (♭) among the clefs. For clef letters, however, only those below which the semitone had its place were chosen. But if b♭ came into the scale, instead of b, c was no longer a letter that could be used as a signature, but b♭ of course, and so b♭ got into the signature; for we must also regard it as originally a signature, if b♭ became necessary, not at the beginning, but during the course of a composition, and was then marked on the staff. Instead, however, of contradicting b♭ by putting in c as signature, the custom was, as soon as *b quadrum (durum)* was to appear again, to place the letter-sign of the same (♮), as well as the *b rotundum* on the staff. But to distinguish more clearly between the two, the angular b was written with strokes through it as ♮ or ♯. In the two, we now recognize the forms of our *natural* and *sharp*; but both were for centuries identical.

Mutation suggested the idea of looking for *mi-fa* in other positions besides above e, b and a; more correctly,

composers soon recognized in mutation a means of asking for the semitone in positions other than those to which the limited received system had assigned it, for instance above d and g, and below g and d, so that one produced the following hexachords:

b♭ c′ d′ e′ f′ g′
ut re mi fa sol la

* *
e f g a b c
ut re mi fa sol la

*
d e f g a b
ut re mi fa sol la

* *
a b c d e f
ut re mi fa sol la

that is, one felt the need of having at disposal two forms of the notes marked with * (two notes standing a semitone apart) as with B♭. But now, instead of using two forms of the respective letters as signatures, the same as with ♭ and ♮, or, before that, G and g, i and ·–, they chose the two forms of the B, and placed the one or the other of the two signs ♭ and ♮ on the staff in the place of the note they desired to alter, so that:

♭ on the e degree lowered it (e♭) and ♮ raised it again
„ „ „ a „ „ „ (a♭) „ „ „ „ „
♮ on the f degree raised it (f♯) and ♭ lowered it again
„ „ „ c „ „ „ (c♯) „ „ „ „ „

So ♭ became the general sign for lowering a note a semitone, and ♮ (or the ♯, identical with it) the sign for raising a note a semitone, and in such a way that each of the two signs served to annul the other, ♯ contradicted ♭, and ♭ contradicted ♯. This system of accidentals was already developed to the extent here given, as early as the 13th century, and, extended a few degrees further, it continued to the end of the 17th century. Notes, changed in this way by a ♭ or ♯, were called imaginary or false. Music with such notes was therefore called *musica ficta* or *falsa*; only *b♭* itself, was not reckoned as belonging to this

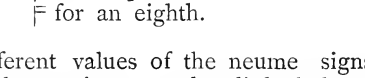
artificial music, as this note beside b (durum) had been hallowed by ancient usage. It is clear that the appearance of music in several parts gave a special impetus to the development of the *musica ficta*, as, for instance, the appearance of a *b molle* in the *cantus firmus* necessitated an e♭, or a *b quadrum* an f♮ (f♯), in order to avoid the so-called *mi contra fa* (the notorious *diabolus in musica*), the augmented fourth or diminished fifth.

129. When did the first signs for the duration of notes come into use in the West?

As it appears, from the 11th to the 12th century with the beginning of the *discantus* (No. 149). Certainly, it is not impossible that one day it may appear that the Latin letter-notation, already used in the 10th century for instruments (organ notation), and which according to all appearances lasted for centuries, but of which we have no documents until its re-appearance in the 15th century as *German tablature*, may have had signs for the duration of the notes; these could then have been no other than those afterwards common to all tablatures:

· for the longest note
| for half of the same
⌈ for a quarter
⊨ for an eighth.

Of the different values of the neume signs, little is now known with certainty; to that little belongs the fact that several dots appearing either before or after a virga,

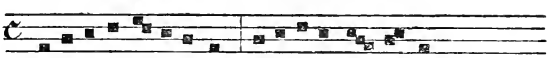


in a time when one may assume tradition to have been to some extent preserved, that is to say, in the first centuries after Guido's reform, were designated as so-called *currentes* (running notes), and in those notations which employed the square-shaped note throughout, were represented only by the rhombic figures (v. ex. at the end of 126). We know further, that the second note of the neumes which expressed two notes (ascending or descending) by one sign *(podatus* and *clinis)*, was held longer than the first, so that both had iambic measurement. But these

assumptions are not beyond doubt. The case changed when the discantus developing in the 12th century for regulating the combination of voices singing together, but with different rhythm, sought and found signs, which quite definitely measured the duration of the note. It is true, that at first this *musica mensurata* (measured music) did not differ externally from the *musica plana* (evenly flowing, as the Gregorian song was soon called in contradistinction to the new art music); the mensural music, for instance, adopted the signs of the neume notation with square headed notes placed on lines, but gave them a meaning there which they had not had before, namely:

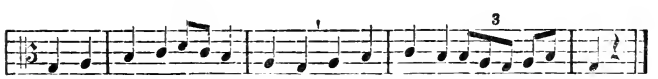
In the Cantus planus:	In the mensural notation:
.. Virga (higher note)	. Longa (long note)
.. Punctus (lower)	. . . Brevis (short note) = $^1/_2$ Longa
.. „ (short)	. . . . Semibrevis (still shorter) = $^1/_2$ Brevis,

with these three signs they got on tolerably well; for simple melodies, such as many *chansons* of the French Troubadours still extant, and songs of the German Minnesänger, they succeeded even with only two kinds of signs (longa and brevis) and chose then as they pleased either ▮ and ■ or ■ and 𝅗𝅥. If several notes had to be sung to a long syllable these (square) notes were placed very close together. These notations were made quite simple, sufficient for need, without scrupulous pedantry, and were unacquainted as yet with rests (which, as a matter of course, were introduced according to the metre). It is so in the conclusion of a *chanson* of king Thibaut of Navarre's (died 1254) which appears thus:

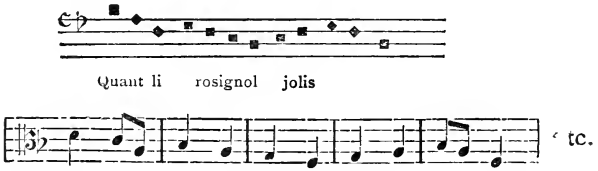


Si li dis sans delaies: Belle, diex vous doint bon jour.

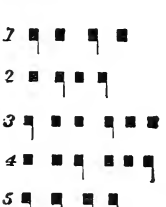
to be rendered thus:



and at the beginning of the well known *chanson* of the *Châtelain* Raoul de Coucy (died 1192):

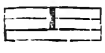


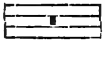
Like the old Greeks, the theorists of this time composed rhythmical *schemata* (series of regular poetical feet), the so-called 6 *modi*:

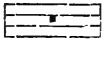


1 etc. (trochaic).
2 etc. (iambic).
3 etc. (dactylic).
4 etc. (anapæstic).
5 etc. (= 3—4, spondaic).
6 (constantly repeated or intermixed with semibreves (subdivision of 1—4).

The true mensural notation, namely, that in several parts, could of course not do without signs for rests. These, for the three oldest notes, are:

 Pausa longa

 Pausa brevis

 Pausa semibrevis.

To the three kinds of notes named, the double longa *(duplex longa)* or *maxima*  , was soon added, whereas it was not until towards the end of the 13th century that the next smaller note was added, viz., the

 minima.

The original relationship, according to which each note was worth double the next smaller one, now vanished entirely in a remarkable manner from theory as well as from the church compositions of the time, in favour of a measure having express reference to the Holy Trinity, and restricted exclusively to triple time; thus the mensural theory advanced from the stage of natural simplicity to the artificial and complicated. They therefore always reckoned at that time according to the value of a longa = 3 breves, or of a brevis = 3 semibreves, or of a semibrevis = 3 minims, or, in other words, they only knew one kind of measure, namely the triple, which again had triple subdivisions (that these directions did not exist in the oldest Troubadour notation, has already been said emphatically). The theory now became complicated, as rules were instituted for cases where notes should still be worth only two of the next smaller kind, or, indeed, as might happen, where the value of a longa (the so-called *perfectio*) should be divided between a longa and a brevis, or where only two breves were still to have the value of a longa. The rules were:

1. A longa followed by a longa, has its full value (is perfect).
2. A longa followed by only *one* brevis is reckoned with this; that is, it loses a third of its value (becomes imperfect).
3. Two breves placed between two longae, are together worth as much as a longa, but so that the second is twice as long as the first.
4. Should the notes be reckoned otherwise than according to the above rules, a dot (punctum divisionis) must indicate the limit of the *perfectio* (from this dot, centuries later, the bar-line was developed).
5. Semibreves between breves, or minims between semibreves, are counted like breves between longae.
6. A brevis appearing at the beginning of a piece before a longa, or a brevis allotted to the following longa by the punctum divisionis, is counted with the longa (therefore the longa loses its first portion).

The most illustrious master of this epoch is Franco of Cologne, who gives the clearest exposition of this doctrine.

An example may make the rules clear:

or, if we represent the longa in our notation by a dotted minim, the rhythmical meaning would then be as follows:

130. When did duple time re-appear by the side of triple time?

At the beginning of the 14th century; and this important reform, which first restored to music freedom of movement and variety of form, is connected with the name of Philippe de Vitry. To this famous composer and theorist, some of whose works on counterpoint are still extant, contemporary authors expressly ascribe the invention of the *four prolations*, that is, the four kinds of time (the distinction of unit of time [*perfectio*] had meanwhile passed from the longa to the brevis):

a) 1 ■ = 3 ◆, and 1 ◆ = 3 ♩ ($\frac{9}{4}$ = nine beats, $\frac{9}{8}$ time).

b) 1 ■ = 3 ◆, but 1 ◆ = 2 ♩ ($\frac{3}{2}$ = our $\frac{3}{4}$ time).

c) 1 ■ = 2 ◆, but 1 ◆ = 3 ♩ ($\frac{3}{4}$ = our $\frac{6}{8}$ time).

d) 1 ■ = 2 ◆, and 1 ◆ = 2 ♩ ($\frac{2}{2}$ = ordinary common time).

Thus the problem was fully solved; and it only remained to find signs by which to express those four values with certainty. For this purpose many experiments have indeed been made, as it appears, some even before de Vitry, for he himself gives us information respecting different kinds of signs for the perfect (triple) and imperfect (duple) time indications. The two oldest signs which also finally remained out of the chaos of attempts, are:

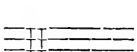
O for the brevis divided into 3 beats.
C for the brevis divided into 2 beats.

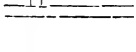
The time-value of the brevis (the new unit of time) received the name of *tempus*, and next they distinguished

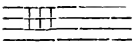
tempus perfectum (■ = 3 ◆) from *tempus imperfectum* (■ = 2 ◆). The value of the semibreve was termed *prolatio*, the perfect (◆ = 3 ◆) being termed *prolatio major* and the imperfect (◆ = 2 ◆) *prolatio minor*. De Vitry expressed *prolatio major* by three dots in a circle (or semicircle) and *prolatio minor* by two. But the simplification of this system, which represented *prolatio major* by a circle with one dot in it (⊙ 𝅝), and assumed *prolatio minor* to be of course (!) meant when the dot was missing, came into general use. With these one might have succeeded:

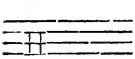
⊙ = Temp. perf., Prol. major ($\frac{3}{3}$ time).
○ = Temp. perf., Prol. major (3 time).
𝅝 = Temp. perf., Prol. minor ($\frac{2}{3}$ time).
C = Temp. perf., Prol. minor (2 time).

had not the ever-increasing canonic artifices of the Netherlanders made the distinction between a three-beat and a two-beat measure of the greatest note-values (longa and maxima) appear necessary. The manifold attempts made (v. a tolerably complete account in the author's Studies of the History of Notations, Ger. edition pp. 254—266), we pass over, and mention only a method of notation, which in the 15th century obtained general recognition, that of Johannes Tinctoris, who represented the perfect and imperfect time-value of a maxima (*Modus major)* by three or two strokes respectively, added to the time signature, and that of the longa *(Modus minor)* by the length of these strokes (through three or two spaces).


Mod. major perf., Mod. minor perf.
(𝌆 = 3 𝌇, 𝌇 = 3 𝌈).

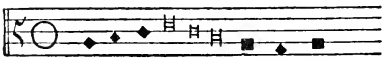

Mod. major imperf., Mod. minor perf.
(𝌆 = 2 𝌇, 𝌄 = 3 𝌉).


Mod. major perf., Mod. minor imperf.
(𝌆 = 3 𝌇, 𝌇 = 2 𝌈).

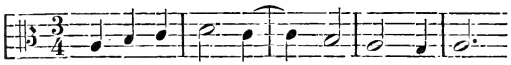

Mod. major imperf., Mod. minor imperf.
(𝌆 = 2 𝌇, 𝌇 = 2 𝌈).

(The strokes through three spaces are intended as rests for perfect longae, those through two spaces as rests for imperfect longae.)

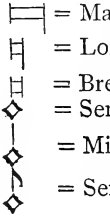
But by the beginning of the 14th century, besides the changes in the method of writing the time-signature, another means of determining note-value came into use, namely, the so-called *color*. For instance, single notes, or groups of notes, which, though following the perfect time-signature, were to be taken as in imperfect time, or conversely, in perfect time after the imperfect time-signature, were painted red instead of black *(notulae rubrae)*. This method of indication proved more striking, and therefore surer, than changing the time-signature for a few notes. But its use was soon restricted to the case in which with a perfect time-signature the notes were to have imperfect time-value, for example, when, with a perfect brevis as the signature *(tempus perfectum)*, three breves appeared which together were to have only the value that two would have properly:



equal to



that is, particularly where syncopation arises, or triplets appear. If the red colour happened not to be immediately at hand, the painting was occasionally left out, and thus it became usual to understand white (unfilled) notes *(notulae albae, cavatae)* as notes rendered imperfect. About 1400, for the sake of convenience, they proceeded to make the notes generally open, as they could then write more quickly. That is to say, from this time the usual form of the notes is:



= Maxima.

= Longa.

= Brevis.

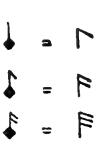
= Semibrevis.

= Minima.

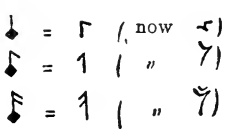
= Semiminima or crocheta.

The rest-sign for the semiminima, added meanwhile, was at first  and for the semibrevis and minima they distinguished  and . As notes of still smaller value were added, the open semiminima  was replaced by the black minima  , and the half semiminima, instead of two hooks and an unfilled head  , obtained a black head and a single hook  ; this note now took the name of *crocheta*, which, however, was soon supplanted by that of *fusa* (even now the English still call the value *crotchet* which was formerly called *crocheta*, i. e. the fourth of the semibreve; the French on the contrary call that note *croche*, which retained the hooked form, i. e. the quaver, eighth of the semibreve). When the open notes had become by far the most numerous, notes with blackened or filled heads (notulae denigratae) came to be used conversely as the unfilled notes had been formerly. These were also called *color*. For smaller values than the minima, blackening is, to be sure, impossible, and between the blackened minims and the similar semiminims confusion is easily possible.

The rests for the semiminima, fusa (crocheta) and the still later semifusa were at first:



But the contradiction in the number of tails to the notes, as compared with the rests, led to the inversion of the hooks of the rests from the fusa down, while to the fusa itself was given a single hook turned to the right:



A particularly difficult chapter in mensural theory, was that on ligatures, that method, taken directly from the neume notation, of representing several notes by one compound sign. The rules for the rhythmical value of the notes in a ligature are the following:

1. The note at the beginning is a brevis
   a) When, with an ascending second note, it has no down-stroke  etc.
   b) When, with a descending second note, it has a down-stroke  etc.
2. The note at the beginning is a longa
   a) When, with an ascending second note, it has a down-stroke  etc.
   b) When, with a descending second note, it has no down-stroke  etc.
3. The two first notes are semibreves when the first note has an up-stroke  etc.
4. The final note is a longa
   a) When, the last note but one being placed lower, it stands directly over this  , later (cf. 6—7) always, except when combined with the last note but one, so as to form an oblique figure *(figura obliqua)*  .
   b) When, the last note but one being placed higher, it is not combined with this in a *figura obliqua*  .
5. The last note is brevis
   a) When, with the last note but one placed lower, it is not placed over this  , later (cf. 6—7) only when combined with the last note but one in a *figura obliqua*  .
   b) When, with the last note but one placed higher, it is combined with this in a *figura obliqua*  .

The rules 4a and 5a underwent an alteration, if, to the final note of a ligature, the turn-like embellishment called the *plica* was to be added; one distinguished an ascending and a descending plica, the direction of which was shown by a stroke (*cauda*) at the end of the last note:

6. The final note, when it has a plica, and the last note but one is lower,
   a) is a longa, if the two last notes do not form a *figura obliqua*  (that is, when it has a plica, the last note, if meant as a longa, was not placed directly over the last but one);
   b) is a brevis, when the two last notes form a *figura obliqua*  .
7. The final note, when it has a plica, and the last note but one is higher,
   a) is a longa, when the two last notes do not form a *figura obliqua* 
   b) is a brevis, when the two last notes form a *figura obliqua*  .

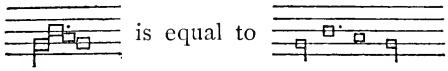
NB. As the plica already disappeared in the 14th century, we were compelled to give the examples in black notes; in white notation it is no longer met with. About the same time the custom also disappeared of placing the last note, when it was meant as a longa, over the lower last note but one, and thus the *figura* became obligatory when it was meant as a brevis.

Lastly, the final rule is:

8. Every note in a ligature, not affected by any of the above prescribed rules, is a brevis.

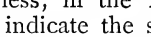
For completeness' sake, let us further remark, that when the first note had the value of a brevis it was termed *proprietas*; when the first two had the value of semibreves they were termed *opposita proprietas*; and the last, when it had the value of a longa, was called *perfectio*. Moreover, within the ligature, every mensural indication preserved its meaning *(imperfectio, alteratio, color)* just the

same as outside it. And even the *punctum divisionis* was also used.



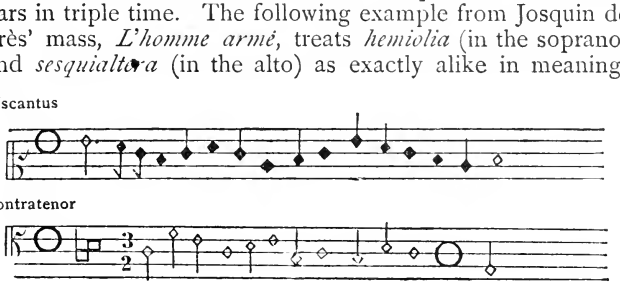
Ligatures not really such, are those produced by joining together several longae and maximae, when the notes within them have their written value.

The idea of *tempo* is foreign to the oldest mensural notation. Nevertheless, in the 15th century, expressions were introduced to indicate the shortening or lengthening of the value of the notes, whether in comparison with the value of preceding notes in the same part, or with that of notes in other parts, or finally, only in comparison with their usual value. These expressions are, *diminution*, *augmentation*, and *proportions*. The proper normal value of the notes now received the name of *integer valor*. The oldest sign of diminution is a vertical stroke through the *tempus* sign:

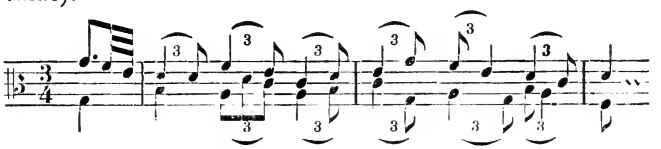


This indicates a shortening of the note-value to one half, so that the brevis must therefore be taken as quickly as the semibrevis ordinarily; as, at that time (15th century), they still connected the idea of bar-unit with the breve, that is, people then counted by semibreves (just as we count by crotchets now, and as the people of the 12th and 13th centuries counted by breves), the effect of the stroke of diminution was that one had to count by breves (whence the name *alla breve*, which we still give to the quickened rate of counting indicated by ¢). Instead of the diminution stroke, a 2, and later a 3, was added to the time-signature thus (2, ○ 3, to indicate that two breves, or three breves, were only to have the value properly belonging to a brevis. Augmentation signified the opposite, and was indicated by fractions, chiefly $^1/_2$ and $^1/_3$, affixed to the time-signature; by its means the half, or the third, of a brevis was extended to the length of a brevis. Other alterations in the value of the notes, besides those named, were designated by the common name proportions. (But many also reckoned diminution as *proportio dupla*, or ○ 3 as *proportio tripla*,

and similarly augmentation as *proportio subdupla* ($^1/_2$), or subtripla ($^1/_3$), among the proportions). Thus we meet with the proportions — $\frac{4}{1}$ or $\frac{1}{4}$, also those with 2 and 3, or $^1/_2$ and $^1/_3$, which have the same signification as — $\frac{3}{2}$, $\frac{6}{3}$ and $\frac{9}{3}$ or $\frac{2}{4}$, $\frac{3}{6}$ and $\frac{3}{9}$; and even $\frac{4}{3}$ and $\frac{5}{4}$, with others still more complicated appear, which belong, naturally, to the most unnatural excrescences of the canonical artifices of the Netherlanders. An exceptional position is occupied by the *proportio sesquialtera* ($\frac{3}{2}$) which is not very easily distinguished from the *prolatio major*. After C, $\frac{3}{2}$ signifies that the semibreve is to be worth three minims, but the semibreve itself retains its value; C, on the contrary, would indicate that the semibreve thenceforward would be worth three minims of the same value as those of which it had before been worth only two. Most confusing is the distinction which the theorists make between *proportio sesquialtera* and *proportio hemiolia* (the same according to the meaning of the words). Externally, they are, to be sure, easy enough to distinguish, since the *proportio hemiolia* always appears in black notes. The *hemiolia* is in fact a bar with three beats and notes of imperfect value throughout; that is to say, a black brevis always counts as two semibreves, but in a bar which contains three; in other words, it is identical with our present notation of bars in triple time. The following example from Josquin de Près' mass, *L'homme armé*, treats *hemiolia* (in the soprano) and *sesquialtera* (in the alto) as exactly alike in meaning:



that is, in modern notation (reduced to a fourth of the value):



131. During the mighty growth of contrapuntal music in the 13th to the 16th century, did not a system of key-transposition develop, such as the Greeks had and as we have now?

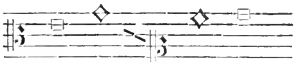
No and yes. As we saw, the *musica ficta* already developed in the 13th century so far as to employ b♭, e♭, a♭ and f♯, c♯; that is, all the five semitones of our present tempered scale of 12 degrees found at least one representative. Nevertheless, it was a long time before any other transpositions were used for whole compositions, or, indeed, for parts of such, than that into the lower fifth, which, by the double form of the *b*, was easily available. Even in the 16th century, the transposition of a transposition, i. e. the signature of two flats, is something exceedingly rare. As one regarded the church modes themselves as different keys, and modulated from one into the other, one counted one's self very rich already in having two registers for each church mode, viz.:

Dorian	from d—d′	without	signature	and	from	g—g′	with	1♭
Hypo-Dorian	,, A—a	,,	,,	,,	,,	d—d′	,,	,,
Phrygian	,, e—e′	,,	,,	,,	,,	a—a′	,,	,,
Hypo-Phrygian	,, B—b′	,,	,,	,,	,,	e—e′	,,	,,
Lydian	,, f—f′	,,	,,	,,	,,	B♭—b♭′	,,	,,
Hypo-Lydian	,, c—c′	,,	,,	,,	,,	f—f′	,,	,,
Mixo-Lydian	,, g—g′	,,	,,	,,	,,	c—c′	,,	,,
Hypo-Mixo-Lydian	,, d—d′	,,	,,	,,	,,	g—g′	,,	,,

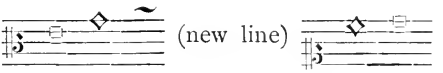
Indeed, only a small number of the means of modulation thus given were made use of. But for the practical need of making compositions as easy as possible to sing, transpositions into other registers were certainly used, and composers devised the ingenious means of adding instructions at once in the notation as to the key in which it should be sung, without deviating, however, in the notation itself, from the almost sacred original register. (It was, in fact, for a long time prohibited by the church under penalty, to introduce any accidentals [except ♭ before b] in the *canti firmi* taken from the Gregorian choral.) The means by which composers indicated the desired transpositions were the so-called *chiavette*. To explain these, we must take a retrospective glance at the development of the clefs.

The clef-letters (at first only f and c) or the coloured lines (red for f and yellow for c) showed where the places of our tenor f and once-marked (middle) c should be; the coloured space (p. 84) which, for the rest, was soon en-

tirely abolished, because it occasioned error if inaccurately drawn, showed similarly the places of small c and once-marked f. Neither the one nor the other clef had a fixed place on the staff, but were removed higher or lower as need required, so that the notes found room on the staff. From the 12th to the 15th century, ledger-lines were still something quite unknown, but instead of them, as soon as higher notes than those which have a place on the staff became necessary, the clef was put lower, or on the contrary higher, if lower ones become necessary. Thus no change was made in the series of four lines (considered enough for the *cantus planus* until modern times) or of five lines (which mensural song always adopted even in the 12th century; but notations in short score, and, later, notations for the organ and clavier instruments sometimes adopted a staff of eight, or even of ten lines). Singers learned the rule: "According as the clef falls, so the pitch rises", and vice-versâ, for example:



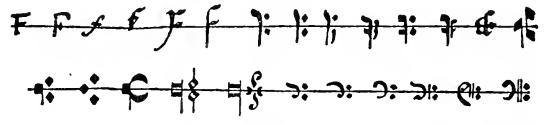
As long as the f and c lines were coloured, the clef-line was bent at the point required and directed into the new position. If the change of clef took place from one line to another, the *custos* pointed out the way; this consisted of a little hook which pointed to the next-following note:

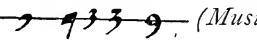


To these two oldest clefs, the g-clef, which showed once-marked g, was already added in the 13th century; but for the music of that time, which was written exclusively for the voice, it was extremely seldom required. It was only in theoretical synopses, or at most in the sketching of scores, that Γ was written for our great G. As the clef originally showed the place where the *semitonium* lay, the g-clef at once indicated that f was raised to f♯; therefore, where this transposition of keys into the dominant (which seldom happened), was not intended, and the g-clef was only chosen to avoid ledger lines, we often find a flat on the f line, as a sign that the lower form of f

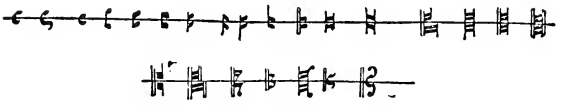
(f♭ molle, i. e. not f♯, but f) is meant. The clef signs themselves were originally large or small Latin letters, but during the course of centuries, they were trimmed and altered until they assumed their present form:

F Clef:

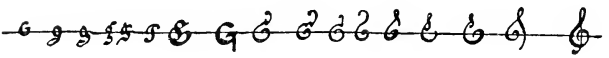


also:  *(Musica plana)*

C Clef:



G Clef:

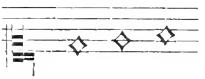
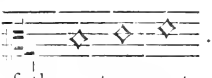
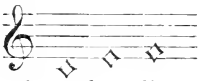


Naturally, with the compass of a single voice scarcely ever passing the limits of a five-line staff, the practice of placing clefs for the different voices on one or the other line, could not fail to prove the most suitable; for of course, the frequent change of clef was in a measure hazardous and misleading. This "domiciling" of the clefs (arrangement of the clefs in their places) was completed in the 15th century, that is to say, the soprano used the C clef on the lowest line, the alto the same clef on the middle line, the tenor the same on the line next the top, and the bass the F clef on the line next the top:

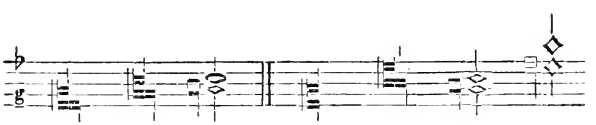
(Forms in the 16th century)

and now it gradually became preferred to add ledger lines instead of changing the clefs. Although originally (in the

11th to the 12th century) the C clef always appeared in company with the F clef (indeed one must in reality say, that the red f, and the yellow c line, constituted the stem; and to these, the intermediate one was added and, if required, higher and lower ones also), yet, in the 13th century (except for score-like arrangements of several voices on more than five lines), it already fell into total disuse, and they restricted themselves to the use of one clef.

The alteration of the clefs, or rather the placing of the clefs at the beginning of a composition on a different line from the usual one, now acquired a different meaning, namely the indication of an altered pitch in which the composer wished the piece to be performed. If he wished the scale d — d' (Dorian) taken a (minor or major) third higher (for which we should now put 3 flats or 4 sharps in the signature), he moved the clef up a third, that is, instead of writing  for the soprano, he, on the contrary, wrote  . The singers then knew that the position of the notes was to be the same as it would be if the latter notation were read in the usual clef (therefore beginning with f); but the semitones lay where the notation really represented them (here from the 2nd to the 3rd note, thus: f g a♭ instead of d e f). On the other hand, the clef was lowered a third when it was desired to sing so much lower, thus: 

(the soprano clef when lowered fell on the ledger lines, and had therefore to be replaced by the g clef) is supposed to begin with *b*, consequently b c♯ d. The higher clefs *(chiave transportate, chiavette)* do not, as we should expect, indicate lower registers but higher ones, and the lower clefs indicate not higher registers but lower ones.



low chiavette high chiavette

Consequently, in addition to the two registers given above (131, at the beginning), one obtained with the high chiavette (apart from the rare signatures of two flats or one sharp) the registers with three flats or four sharps, and, with the low one, the registers with three sharps or four flats:

Dorian	from	f—f′	(f♯—f′♯)	and	B—b	(B♭—b♭)
Hypo-Dorian	,,	c—c′	(c♯—c′♯)	,,	f♯—f′♯	(f—f′)
Phrygian	,,	g—g′	(g♯—g′♯)	,,	c♯—c′♯	(c—c′)
Hypo-Phrygian	,,	d—d′	(d♯—d′♯)	,,	g♯—g′♯	(g—g′)
Lydian	,,	a♭—a′♭	(a—a′)	,,	d—d′	(d♭—d′♭)
Hypo-Lydian	,,	e♭—e′♭	(e—e′)	,,	a—a′	(a♭—a′♭)
Mixo-Lydian	,,	b♭—b′♭	(b—b′)	,,	e—e′	(e♭—e′♭)
Hypo-Mixo-Lydian	,,	f—f′	(f♯—f′♯)	,,	B—b	(B♭—b♭)

Then, besides this, the chiavette could also be employed in notations with the signature *b molle*, so that, for example, the Dorian scale was possible on the d degree (cantus naturalis) without signature, on the e (e♭) degree with the low chiavette and the signature of ♭ *(cantus b mollaris* or *transpositus)*, on the f (f♯) degree with the high chiavette, on the g degree with ♭, on the a degree with ♯, and on the b (b♭) degree with the low chiavette, that is to say, seven transpositions could in fact be indicated.

132. How did the early mediæval instrumental (organ) notation become further developed?

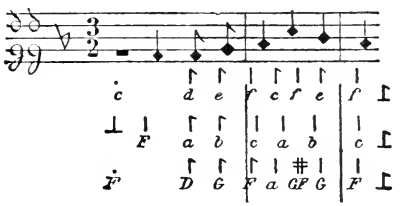
For a long time we lose all trace of it, but in the 15th century we find it in general use among German organists, when it had two octave divisions, viz. f—e and a—g (cf. 123), and the following rhythmical signs:

• in transcribing mensural notes is equivalent to the brevis
| = Semibrevis (𝅜)
♩ = Minima (𝅗𝅥)
♫ = Semiminima (♩)
♬ = Fusa (♪)

If several notes with hooks belonging to one note of greater value followed each other, cross-lines were drawn through the stems in place of the hooks, thus:

These signs were written over the letters indicating the notes, or over a stroke indicating a pause:

It is remarkable that the tablatures (not only the organ tablature, but also the lute tablatures, soon to be mentioned) always show the bar-line, which in the mensural notation only developed about 1600 from the *punctum divisionis*. Very often, in the German organ tablatures, one meets with notations in which the highest voice, consisting throughout of blackheaded notes of the semibreve form, but with stems, etc. marking values peculiar to the tablature, is placed on a five-line staff. These notations have a great external resemblance to the *proportio hemiolia* of mensural notation, but have nothing to do with it. Such melodic parts often have the g clef indicated in the form of a double g (g g) and the d clef (d d) is, singularly, often associated with it; but this was never anything but a superfluous luxury, as it never showed the semitonium:



As the German tablature continued to be used by organists into the 18th century, and even in the 17th was altogether more familiar to them than the mensural notation, it is not surprising that they openly threw their influence into the further development of the latter in proportion as preference more and more inclined to those notes which gave the notation a resemblance to the tablature, viz., the crotchet, quaver and semiquaver. The common cross-lines also passed into the mensural notation. This process of assimilation became complete in the 17th century. With the German organ-tablature, both in the form and use of the rhythmical signs, the lute tablatures agree; but pitch was indicated in it on quite a different system, namely by

frets. The most varied methods of marking the frets were in use according to time and place. The best known are: the so-called Italian lute tablature, which represented the 6 strings of the instrument by a staff of lines (the lowest string as the highest line), and marked, on each string, the ascending semitone series up to the octave, with the figures o (open string) 1 2 3 4 5 6 7 8 9 X Ẋ Ẍ; the French lute-tablature was arranged similarly; but it had five strings (lines) only (the highest string at the top), and, instead of numbers, used the letters, a b c d e etc. for the semitone scale. Incomparably more impractical was the German tablature; originally intended, like the French, for only five strings, it marked the five open strings as 1 2 3 4 5 (5 being the highest), and an alphabet, ascending by semitones, and running diagonally across the five strings from fret to fret, indicated the fingering, thus:

5 e k p v 9 $\bar{e}$		a′ b♭′ b′ c′ c′♯ etc.
4 d i o t 3 $\bar{d}$		e′ f′ f♯′ g′ g♯′ a′
3 c h n s z $\bar{c}$	=	b c′ c♯′ d′ d♯′ e′
2 b g m r y $\bar{b}$ etc.		g g♯ a b♭ b c′
1 a f l q x $\bar{a}$ f		d d♯ e f f♯ g

so that it must have been very wearisome to decipher, for it offered absolutely no mnemotechnical aid, except that the letters following each other in the above vertical series, coincided with the pitch of the open strings in the higher position. The 6th (lowest) string, introduced later, was marked either after the Italian manner $\bar{1}$ $\bar{2}$ $\bar{3}$ etc., or after the French one by A B C D etc., or with signs answering to the lowest of those in the above *schema* (1 A F L, etc). In other respects the method of notation coincided entirely with the German organ tablature.

The 17th century blended the French and Italian lute tablatures into a mixed system which was accepted in Germany also (tuning: A d f a d′ f′, tablature: six lines with a, b, c, d, e, etc. for the frets, and $\bar{a}$ $\bar{\bar{a}}$ $\bar{\bar{\bar{a}}}$ and IV for the bass strings).

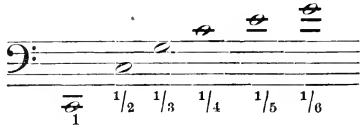
SEVENTH CHAPTER.

THE MODERN TONE-SYSTEM.

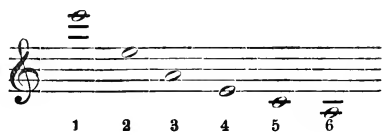
133. Did the revolution, which, at the beginning of the 16th century, entered into all musical creation, compelling the recognition of a new period — that of harmonic music and accompanied melody — make itself felt in the further development of the tone-system and notation?

Certainly; for it was just about this time that the theory of harmony originated, that is to say, the proper connection of the notes now began to be regarded from quite a new point of view. It is true that the ancient Greeks understood the meaning of a consonance, or smooth combined sound of two notes, even though it may not be fully proved that the consonant intervals were in any way taken account of as consonances in the actual practice of music. The Greeks named the consonances *symphonies*, but they named the octave in particular *antiphony* (the interval which comes into consideration in the polyphonic music of antiquity) to distinguish it from the *paraphonies*, the fifth and fourth with their compounds the 11th and 12th. Thirds and sixths were counted by them, like seconds and sevenths, as dissonances *(diaphonia)*. The first people to perceive the consonances of the third and sixth were, as we saw (114), the Arabians. The West made its first rough studies in the combination of several parts, other than in octaves or unisons, in the *organum* (v. 148), with only consecutive fourths and fifths. The faburden (150) brought, in place of consecutive fifths, consecutive sixths and thirds, that is, according to modern ideas, a succession of perfect triads, but without recognition of the existence of harmony, only as the accidental result of attempts at combining the parts in parallel motion. The *discantus* at last (149) brought the principle of the contrary movement of the parts and with it the cause of hindrance for centuries to the recognition of the principle of harmony. For now the chief attention was no longer directed to the single chord, but to the movement of the separate voices, and but little attention was paid to the method of combining the parts by fixing the intervals

which they formed according to the requirements of the ear. It is true that meantime they discovered as early as the 12th to the 13th century (Franco of Cologne), the still valid prohibition of consecutive octaves and fifths (indeed even consecutive thirds were considered in bad style), but the meaning of a consonant chord they did not discover. Also, when they passed from two-part to three and four-part writing, the science had not yet expressions or names for the resulting consonances, which, naturally, by instinct and routine, soon enough arranged themselves in the same way as later on clearly recognized principles. It is true they had recognized the third as a consonance; but they had only assigned it a kind of middle position, together with the sixth, as an imperfect or accidental consonance; consequently, all beginnings and cadences were for a long time without the third, having only the octave (unison) and fifth. The man who appears to have been the first to find the conception of harmony, was the famous contrapuntist and theorist, Joseffo Zarlino, director of the music at St. Mark's church, Venice. This master accepted the definition of the major third, first set forth by Ludovico Fogliani in his *Musica Theorica* (1529) in continuation of Ptolemy's views of the tetrachord divisions, as 4 : 5, and of the minor third as 5 : 6, and now found that all consonant intervals keep within the ratios $1 : {}^1/_2 : {}^1/_3 : {}^1/_4 : {}^1/_5 : {}^1/_6$ and $1 : 2 : 3 : 4 : 5 : 6$; the former he named *divisione armonica*, and the latter *divisione aritmetica*. It is well known that the first series (taking 1 as the whole length of the string = C) gives the following notes:



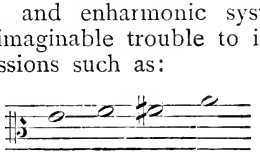
that is to say, the chord of C major; but the second series (taking 1 as the length of the string from e^3) gives:



therefore the chord of A minor. Indeed, Zarlino recognized, and emphasized the fact, that the difference between the minor and major chords was not in the kind but in the position of the third. Of other harmonies than these two Zarlino does not speak at all, and therefore appears to have recognized that in them the essence of harmony, which in its nature is throughout dual, consists. It is, indeed, strange enough that this recognition of a fact, clear as the sunlight, was not immediately greeted by the whole musical world as the true redemption and revelation (it is contained in Zarlino's *Istitutioni armoniche*, published 1558); but perhaps it was one of the intellectual achievements for which Zarlino became so famous. It must, however, be admitted that Zarlino's discovery remained for a time practically unfruitful, because he failed to draw any further results from it, like his next following discoverer of the dual principle (Tartini), who also was unable to advance far enough to develop the entire system of chords from this principle. It was reserved for our century to perfect the system in this manner (Moritz Hauptmann, A. v. Oettingen, and following these, the author of this little book).

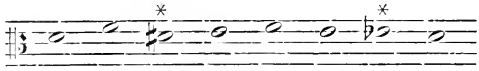
134. Did the musica ficta, or system of accidentals, develop beyond the point it had reached in the 13th century?

Certainly, but not until the 16th century. The study of the antique, which revived at that time in every department, and to which we owe many an impetus to progress, had led Fogliani back to Ptolemy's classification of the intervals. But the recognition of the third as a perfect consonance (owing to the simple number of its vibrations, 4:5 or 5:6 respectively) was not the only result of these antiquarian studies. Composers also sought to revive the antique chromatic and enharmonic systems, and gave themselves every imaginable trouble to introduce a great number of progressions such as:

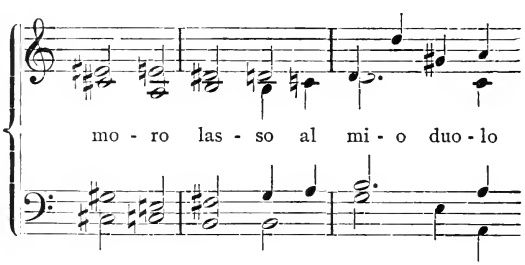


into their compositions, and harmonize them. The enharmonic was of course more difficult to revive; but as it had been acknowledged that notes such as d♯ (as the

semitone below e) and e♭ (as the semitone above d), or g♯ and a♭, did not exactly agree in pitch, it was hoped to trace, in their difference, the old enharmonic system with its quarter-tones. To make the *enharmonic* notes follow each other immediately, was of course impossible; they therefore contented themselves with letting them follow each other with as few intermediate notes as possible:



The first to start this new chromatic and enharmonic style was Nicola Vicentino (1546); to him succeeded Cypriano de Rore, with his *Chromatic Madrigals* (1560), then the Prince Gesualdo of Venosa (1585), and Luca Marenzio (1580). Andrea Gabrieli, also, did not reject the innovation. The birthplace of the chromatic style therefore was Venice, and the time of its birth, the time of Zarlino's eminence. That was indeed a complete and violent rupture with the inflexible diatonic progression of the church modes; for although solmisation had matured the *musica ficta*, yet actual chromatic progressions within the limits of this theory were impossible (changing the meaning of fa into mi). The complicated accompanying parts made necessary by these intentional progressions, led, from their nature, to an extraordinary enriching of harmony, as the ear naturally sought to satisfy its own claims. For instance, the Prince of Venosa writes thus:



It was soon enough seen, that with the enharmonic and chromatic in the form in which the Greeks had bequeathed them, very little could be done; but men had acquired a taste for the new harmony progressions, and the abiding gain was a disregard for the precepts of an antiquated

theory, and the free introduction of chromatically altered notes where the ear approved them, to the horror of theorists who could do nothing with progressions agreeing neither with antique theory nor solmisation.

Vicentino also constructed a clavier (*archicembalo*) on which the enharmonic and chromatic tetrachords could be perfectly produced, that is, one which had separate keys for c♯ and d♭, d♯ and e♭, f♯ and g♭, g♯ and a♭, a♯ and b♭. Zarlino had a similar instrument made in 1548 with 19 keys within the octave, which, besides double upper keys, had an upper key between e f and b c. All these attempts proved fruitless, as the most recent attempts (Helmholtz) to increase the number of the notes of practical value within the octave, will also prove before the 12 degrees of equal temperament. But the keyboard had already developed to its present form in 1500, and Pietro Aron (1523) gives directions for the tempered (unequal) tuning of the notes. Equal temperament was introduced, as is known, only as the 17th century was closing (Neidhardt and Werckmeister). But of supreme value in the further development of the theoretical recognition of tone-relationship, was the discovery made already by Zarlino, that to one and the same note different acoustical values must be ascribed according as it is derived by progressions of a fifth only, or with the additional aid of progressions of a third. Zarlino recognized the difference between d tuned as the third from b♭ (5 : 4) and the d reached by steps of a fifth (fourth) from b♭ (b♭ — f — c — g — d); the latter is about $^1/_{10}$ tone higher (81 : 64 instead of 80 : 64). If we distinguish notes of the third, which are thus about a comma ($^{81}/_{80}$) lower or higher, by placing the comma stroke under (e) or over (e♭) to indicate the lowering or raising of the note, then major and minor chords tuned to just intonation would require on every degree of the scale only the following equivalents: c e g, c e♭ g, d f♯ a, d f a, e g♯ b, e g b, f a c, f a♭ c, g b d, g b♭ d, a c♯ e, a c e, b d♯ f♯, therefore c c♯ d d d♯ e♭ e f f♯ g g♯ a♭ a a b♭ b c. If we seek the leading-note (mi-fa!), from above and below, to each note of the fundamental scale (but with d and a doubly represented) we require 19 different notes, viz., c d♭ c♯ d d e♭ d♯ e f g♭ f♯ g a♭ g♯ a a a♯ b♭ b c.

Probably this was the tuning of Zarlino's 19-keyed clavier. In fact, our modern tone-system, that is, the theoretical definition of pitch-relationship, within the scale as within the harmonies, was in its outlines definitely established by Zarlino. The attempt to burden practice with the fine distinctions which arise from different ways of comprehending a note (i. e. as a third, or fifth) was excusable, certainly, in those who first obtained this new insight into the nature of chords. But practice soon gave up a problem it could not solve, and only theory henceforth clung immovably to the new views.

135. Were these fine distinctions as to the difference of notes, taken notice of later in the art of composition?

No. The illusion that it was possible to revive the magic effects of the old Grecian music, vanished when, by means of those distinctions, new paths and new forms of notes had been found. Practice — fresh, joyous creation in the new style — monopolized interest, and for a long time completely silenced theory. For practical instruction in composition, however, there arises in the so-called thorough-bass an entirely new, and thoroughly practical means. Thorough-bass is, in fact, a kind of figure-tablature, and just as we found the lute-tablature with figures in Italy, so also we find thorough-bass to have had its home there. As composers of the time of the highest development of contrapuntal artifices, always kept their scores secret, so that their *technique* might not be discovered, the study of a new complicated work only printed in parts (and besides without bar-lines, which would have made the reading a little easier) was extremely difficult. It appears that to enable themselves to support the choir correctly during study, as well as during the performance of a piece, the Italian choir masters and organists wrote, in figures over the bass part, the intervals of which the harmonies made by the remaining parts were composed. The custom also which was springing up of performing a polyphonic vocal piece so that only the *discantus* was sung, the other parts being rendered as well as was possible on an instrument capable of polyphony (organ, harpsichord, lute), may also have led to this kind of *intavolatura*, which of course was only an imperfect one — a kind of sketch. In short, towards 1600, thorough-bass appears in a complete shape in printed works, just at the time of the rise of the new style of accompanied

melody. The concurrence of the two innovations might appear as a wonderful coincidence, were not the inner connection, the common root, to be sought in those imperfect performances. Thorough-bass showed itself eminently suited to play a part such as is now played by pianoforte arrangements — that of deputy. But now it received a new and much more important part, as composers began to write works intended from the first to be performed in this way. The bass part now became continuous from beginning to end (*continuo*), while its figures represented the harmony contained in the work. The first works printed with figured bass (for example, the *Church concertos* [1602] of Ludovico Viadana, who has been incorrectly represented as the inventor of thorough-bass figuring) already give the appropriate abbreviations of the figuring, which have been retained to the present day. They are:

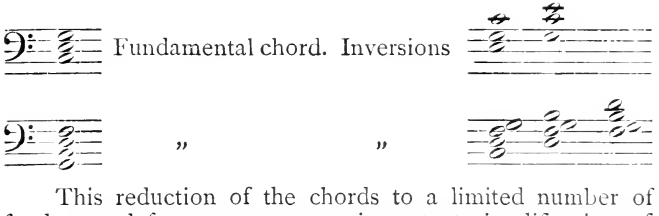
a) The omission of all figures above the bass note, indicates the third and fifth of the same, as they would arise according to the signature.
b) a 6 over the bass note indicates the sixth (which takes the place of the fifth,) and the third as well.
c) a 4 excludes the third, but includes the fifth.
d) every accidental required, is written beside the number corresponding with the degree to be altered.
e) accidentals standing alone relate to the third.

These definitions are not the excogitation of a single clever thinker, but rather the result of the growth of tens of years, which excluded everything superfluous (for example the $\frac{5}{3}$ so frequently required over the bass). It is evident that in them speaks an already far developed feeling for the harmonic relation of the notes. Whether this development was the result of the discovery of the principle of harmony by Zarlino, or whether, on the contrary, that discovery of Zarlino was itself the sign of the entry of the idea of chords into the general consciousness, may remain undecided. And now, instruction in the correct performance of a figured part became a new branch of education. The new style spread with lightning speed over the whole of Europe. All composers wrote figured basses to their works, and all organists (no longer only Italians) and choir masters were obliged to become skilful thorough-bass players. For

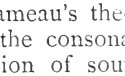
the chords and for the harmonies therein developed, a short terminology connected with the figuring came into use, such as, harmony of the major and minor third, chord of the sixth, chord of the sixth and fourth, etc. that is to say, the first primitive theory of chords was created. But thorough-bass continued, notwithstanding, to be a purely practical affair, which had no connexion with the teaching of composition; the latter still remained as before in the track of counterpoint, into which, to be sure, the idea of thirds, etc., gradually crept. But for the thorough-bass player, it was still a question only of understanding and executing the directions of the composer, not of producing anything of his own. Only when this is kept in mind can one unterstand the attention which, at the beginning of the 18th century, Rameau excited, when he began combining real theory and advice on composition with thorough-bass.

136. In what did the novelty of Rameau's theory consist?

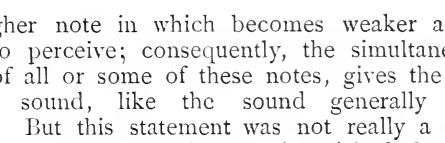
In 1722, Jean Philippe Rameau published his *Traité d'Harmonie*, and obtained extraordinary success, because he found the appropriate words to express what had long been in the feelings of all, though unexpressed, and which now appeared as clear as noonday; his doctrine of the inversion of chords was a veritable egg of Columbus. It was not really a new discovery, that the chord of the sixth on *e* had the same harmonic significance as the triad on *c*. Zarlino's reference to the two original harmonies decidedly implies this knowledge. But who was still thinking of Zarlino? Over thorough-bass, his attempts at a rational explanation of the nature of chords, had been entirely forgotten. Indeed, the case was worse than before the invention of thorough-bass, because in thorough-bass every combination of notes over a bass note appears to have equal importance; the preference shown to the triads in leaving them unfigured, distinguished these only as the most frequent, not as the fundamentals of the rest. The easily intelligible chief point in Rameau's teaching of inversions is, that all chords consisting of thirds placed one above another are fundamental, and all other chords are deduced from these. Therefore firstly:



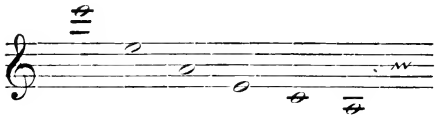
This reduction of the chords to a limited number of fundamental forms, was a very important simplification of the apparatus for teaching harmony. Rameau expressed this thus, that for c e g, e g c and g c e, the fundamental note was the same, viz. c. The fundamental notes, he wrote as simple black notes without stems, thus:



The second point in Rameau's theory which excited attention, was his referring the consonance of the major triad to the natural composition of sounds, which means that the note C, on our musical instruments, proves upon nearer inspection and earnest attention to be composed of:



every higher note in which becomes weaker and more difficult to perceive; consequently, the simultaneous production of all or some of these notes, gives the effect of a single sound, like the sound generally regarded as single. But this statement was not really a discovery of Rameau's, inasmuch as Sauveur (1700) had already given a scientific account of it, although Rameau was the first who recognized its value in the theory of music. The derivation, already given by Zarlino, of the major chord from this same series, now suddenly obtained an entirely new foundation; the major chord appeared to have been produced by nature itself. Gladly would Rameau have traced the minor chord to a similar natural foundation; he was, indeed, on a track which might have led him to the goal; he noticed, for instance, that all the strings which are tuned to notes in the following series:

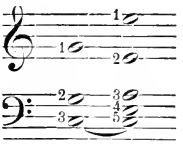


vibrate strongly as soon as the highest note (e^3) is sounded. Unhappily, however, the natural philosopher, d'Alembert, taught him that these simultaneously vibrating strings, divide into as many parts as are required to produce the highest note, e^2 with one, a^1 with two nodal points, etc. Hereupon, Rameau gave up the attempt to explain the minor chord similarly with the major chord. And now, the natural foundation appearing to him wanting, it seemed to him like a spoiled major chord (with a lowered third). For in this Rameau still held to the principle of thorough-bass, viz., that all harmonies are produced upwards from their lowest note; only, for those harmonies which he held to be inversions, he assumed one of the higher notes to be the true fundamental note. Without doubt, he would have given his system a different structure had d'Alembert not dissuaded him from his attempted explanation of the minor chord. And this is the more probable, as Rameau's system in some other points also, is closely related to a theory which has lately been called by Helmholtz the doctrine of *Klangvertretung*, that is the theory of the representative meaning of chords. Rameau sees, for instance, in the diminished triad b d f (not always, to be sure, but often — his system on the subject is not fully matured) a chord of the seventh with the fundamental note left out, thus the *son fondamental* of b d f is g which is not to be found in the chord; further, he sees in f a c d (not always, but often) not an inversion of d f a c, but the chord of F major with d (sixte ajoutée), so that the fundamental note is not d but f. The author of this book is the first who has enlarged upon these principles of Rameau so as to refer every harmony to some major or minor chord to which either a note has been added, or in which some note has been chromatically altered, or replaced by a neighbouring diatonic note.

137. Has not another succeeded where Rameau failed, namely, in finding a natural foundation of the minor chord?

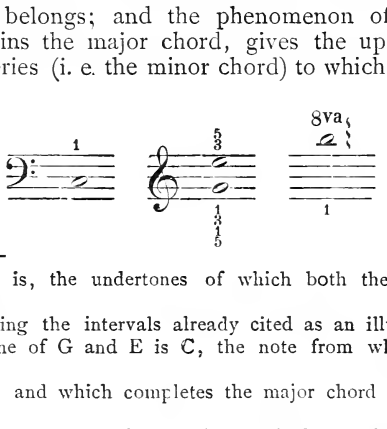
Giuseppe Tartini, the famous violin virtuoso and eminent composer, was at the same time a musical theorist

by no means lightly to be esteemed. In 1714, he discovered, as he himself relates, the phenomenon of the resultant tones, and made the first use of it in testing the purity of the intervals in violin playing; but he recognized later its importance in reference to the theory of the minor. He placed it on an equality with the phenomenon of harmonics, indeed he explained the two phenomena as being one and the same, but known, hitherto, only superficially; that is, he considered that besides the upper series of harmonics, there is below the fundamental note of the chord, a corresponding lower series, which becomes audible where the under harmonic series of two notes sounding simultaneously, coincide, for example, if g^1 and e^2 be sounded together:



that is c is the first lower harmonic common to g^1 and e^2. For the rest, Tartini appears to have studied Zarlino, as he gives this master's explanation of the minor almost word for word, only more energetically and rather more elaborately. He denies that we get the minor by changing the third of the major chord, and that the minor is therefore *imperfetto e mancante*, and maintains rather that the third of the minor chord differs from that of the major not merely as to position (lying uppermost instead of lowest in the triad) but as being altogether a different kind of third (namely, because c e in the chord of A minor, must be understood as if c were the lower third of e). The theory of combination (resultant) tones has moreover received several different interpretations. At first (in the *Trattato di Musica*, 1754) Tartini gave all the resultant tones an octave too high, which clearly hindered him from getting his comparison of the two series perfectly correct; but in a later work (*De' principj dell' armonia*, 1767) he corrected himself. In Germany, the resultant tones were discovered independently by G. Andr. Sorge (given in the *Vorgemach musikalischer Composition*, 1740). Acousticians mostly derive the resultant tones from the upper series of harmonics, so that, as they say, the resultant tone corresponds

with the difference between the relative number of vibrations of the simultaneously sounding notes; for example, $g^1 : e^2 = 3 : 5$, difference 2 (= c'), instead of always taking that note as resultant tone, in the upper harmonics of which the interval can be represented by the lowest ordinal number, thus 1 = (tenor) c. The number of resultant tones which are distinctly audible, is by no means limited to a single one (which would always be the note 1), but rather, besides these there are resultant tones of the upper harmonics to be heard now louder and again softer. After Helmholtz, A. von Oettingen has also laboured to complete the foundation of minor harmony. Helmholtz, who holds to the differential tones instead of the common undertones* opposes to them above them, the summational tones; e. g., the ratio $g^1 : e^2$ being $3 : 5$, the summational tone will be $3 + 5 = 8$, i. e. c^3. But A. von Oettingen rightly remarks that the upper tone which will be prominently heard is rather the first overtone common to the two lower notes; *e. g.*, $3 \times 5 = 15$, that is, for g^1 e^2 the note heard will be b^3, not c^3. (v. Oettingen's *phonischer Oberton.*) Thus in a wonderful manner the two phenomena are the complements of one another; the phenomenon of the undertones, by which the minor chord is explained, gives the fundamental tone of the series of overtones to which an interval belongs; and the phenomenon of overtones, which explains the major chord, gives the upper note of the lower series (i. e. the minor chord) to which the interval belongs**:



* That is, the undertones of which both the upper tones are partials.

** (Taking the intervals already cited as an illustration, the differential tone of G and E is C, the note from which they are both derived, and which completes the major chord G E C; while the first overtone common to the two is B, which completes the minor chord, B G E. Translator.)

If anything further be wanting for the satisfactory explanation and foundation of the minor chord, the statement by the author of this book might suffice for this, namely, that every note fulfils the conditions necessary to produce all the notes of the under series of harmonics, viz. a fixed number of concussions in a second. Were every second vibration of a given note, e. g., c^1, a little reinforced, then little c, as well as c^1, would without doubt be distinctly audible; and this reinforcement really takes place for a lower undertone common to two notes produced independently. So now we may really see an explanation of the minor chord in the nature of sounds similar to that given of the major harmony.

138. When did the modern modes — the major and minor scales — come into use, and when did they take the place of the church modes?

About the same time that the conception of harmony struggled into consciousness in Italy (Zarlino, 1558), a Swiss musical *savant*, Heinrich Loris of Glarus, surnamed Henricus Loritus Glareanus, made the demand that the number of church modes should be increased from 8 to 12. The two new church modes demanded by Glareanus were the Ionian (connected by name with the Iastian transposition scale of the Greeks).

authentic

G A B c d e f g a b c′ or transposed, from f—f′ (c—c′) with ♭ before b,

plagal

and the Æolian (likewise connected by name with one of the later Grecian transposing scales):

authentic

e f g a b c′ d′ e′ f′ g′ a′ or transposed, from d—d′ (A—a) with ♭ before b.

plagal

The need of the creation of these two scales had certainly become evident; for the four-part songs in simple popular form which sprang up about the year 1500 like returning spring-blossoms, the *frischen teutschen Liedlein*, *Reutterliedlein*, the French and Italian *canzone*, and the yet

simpler *frottole* and *villanelle*, especially, present examples of harmony which would not agree with any of the old church modes. The instinct of harmony had just found out what theory only later comprehended (and it was not clearly expressed until the present century), that a perfectly satisfactory cadence, indeed clear, definite harmonic structure is possible only in the harmonic group, which places next to the chief chord (now called the tonic), both a relative from the upper series of harmonics (the dominant) and a relative from the lower series (the subdominant). Any conception of harmony was, as we are aware, remote from the original idea of the antique octave species from which the church modes were developed, at least, no Greek ever thought of representing a chord consisting of the hypate meson with its third and fifth as a chief harmony. Let us remember that the Ancients regarded the mese rather as the tonic, so that the Dorian octave species:

e f g a b c d e

was the one which really represented a chord of A minor (though without conscious introduction of the third, c) as the middle point, while beside this stood an E minor and a D minor chord as dominants:

Tonic

d (f) a (c) e (g) b

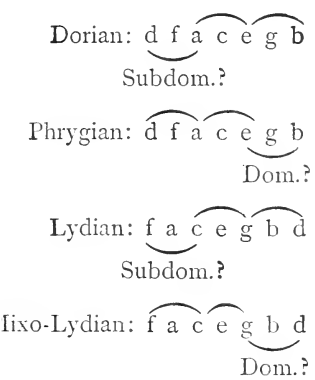
Subdominant Dominant

From this we can well understand why the Dorian mode appeared to the Greeks as the best. The church modes were certainly intended originally to be similar. We merely mention, that the oldest Byzantine church modes were similarly constructed, as the plagal modes were defined as lying a *fifth* below the *κυριοι*. But the newer order of church modes (from the 8th century at least) places the plagal modes a *fourth* below the authentic, that is, regards the outside notes of the authentic modes as fundamental and feels the fifth as the tonic harmony:

Dorian d (f) a, Phrygian e (g) b, Lydian f (a) c,

Mixo-Lydian g (b) d.

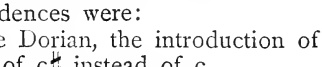
As polyphony now developed and the harmonization of the modes took place accordingly, all kinds of difficulties and inconveniences presented themselves more and more distinctly. With not one of the church modes was it possible to get a perfectly satisfactory cadence without the aid of the *musica ficta*, that is, without deviating from the strictly diatonic; for not one of the church modes shows the tonic chord between two dominants, but places it rather in such a position that it must itself have the significance of a dominant:



The necessary result was a compromise between regard for the purity of the scales used, and the claims of the ear to a reasonable rounding off and cadence, so that in the course of the pieces the dominant feeling was impressed on the cadential harmonies, but at the close a tonic significance (that is a feeling of finality) was obtained by the introduction of raised or lowered notes. The licences permitted in cadences were:

a) For the Dorian, the introduction of b♭ instead of b and of c♯ instead of c.
b) For the Lydian, the introduction of b♭ instead of b.
c) For the mixo-Lydian the introduction of f♯ instead of f.

Thus the following certainly very different systems arose:



Lydian in the final cadence b♭ d f a c e g
Tonic

Mixo-Lydian „ „ „ „ c e g b d f♯ a
Tonic

With the Phrygian (the compass of which was exactly that of the once most esteemed octave species, the Dorian of the Greeks!) nothing similar could, to be sure, be done; the conclusion f e, with which most Phrygian melodies end, would not admit of the introduction of f♯, and to introduce d♯ with f was at that time quite inconceivable. So for the Phrygian, one had to be content with a species of half cadence, the final chord being changed into a major chord (e g♯ b); but even thus, one created quite a different system:

d f a c e g♯ b
Dom.

From all this, it is clear enough that Glareanus' proposal to adopt two new church modes in which the arrangement of the harmony should at once be such as must have been necessary in the cadences of the old church modes, came as a relief, thus:

f a c e g b d
Tonic

and with the admission, in cadences, of the *subsemitonium modi*, of the leading note and in the ascent to this, also the raising of the 6th degree:

f♯ g♯
d f a c e g b
Tonic

Thus, at last, theory was again placed in accordance with the practice of the time. Although for some time the new church modes were regarded as at most on an equality with the old ones, yet it was not very long before the relationship was reversed, that is, the old ones were

admitted to be on an equality with the new, although composers put the old ones more and more into the background, until at last Mattheson buried them, and all solmisation with them ("The long cherished orchestra in which ..... the long banished *ut re mi fa sol la tote musica*, under the distinguished escort of the twelve Greek modes, as honourable relatives and mourners, are conducted to the grave and honoured with a monument to eternal memory", 1717). Solmisation had meanwhile died out, from a syllable (si) having been assigned to the 7th degree also; mutation was entirely given up; and the Latin nations (Italians, Spanish, French) kept the syllabic names, instead of the letters, in the following order:

ut re mi fa sol la si
= c d e f g a b

(in Italy, for the last 200 years *do* has replaced *ut*) and added a ♯ (called *diesi*, *dièse*, a name which appeared in the 16th century, during the time of experiments with the Greek tone-genera) or a ♭ (b *molle*, *bémol*) when necessary to each syllable, thus, ut♯ = c♯, mi♭ = e♭ etc. The Germans adhered to the letters as they had been preserved in the organ tablature, and allowed the solmisation syllables to disappear entirely. The h (for b♮) got into the German alphabet in the 16th century through the German tablature which, in place of ♮ (b quadrum) used the printed form ♄. The tone-system and with it the system of transposing keys found its final exclusion after the institution of equal temperament (first through Andreas Werckmeister, 1691 — "Musikalische Temperatur" and J. G. Neidhardt, 1706: "Die beste und leichteste Temperatur des Monochordi"). About the same time the final distinction was drawn between ♯ and ♮, so that to contradict a ♭, it was no longer a ♮ that was used, but simply ♮, and to contradict a ♯, it was no longer ♭, but also ♮ which was used. The double sharp and double flat, on the other hand, only appeared later, as J. S. Bach, in the first part of his "*Wohltemperiertes Klavier*", (1722), still indicates the further raising of a note, already raised in the signature, by 𝄪. Simultaneously with solmisation and the church tones, the last remains of the old mensural definitions disappeared — the perfect-time signature was entirely given up, and the triple value of a note was shown by a dot after the note. This dot which, as early as the 14th century, began to find a place in

imperfect time also with a similar meaning, as the *punctum additionis*, must be carefully distinguished from the *punctum divisionis* which only marked a boundary, and in the 15th century developed into the bar-line, at first only in scores (there even earlier) and tablatures, but from 1600, in the mensural notation also. *Color* also *(hemiolia)*, now became altogether superfluous; and Mattheson sang a requiem also for the last of the ligatures (two semibreves ).

The time signatures, likewise, underwent that remodelling which gave them their present form. Sebald Heyden, 1537, in his *Ars Canendi*, mentions that in *prolatio minor*, that is in common duple time, the semibreve constituted the bar unit and that the minima  was equal to $^1/_2$, the semiminima  $= ^1/_4$, the fusa $= ^1/_8$ and the semifusa $= ^1/_{16}$ of a bar. When notes which contained three notes of the next smallest value entirely disappeared the notes received in Germany generally the following descriptive names — whole note, half, quarter, eighth, sixteenth (*Ganze*, *Halbe*, *Viertel*, *Achtel*, *Sechzehntel* — in England the names semibreve, minim, crotchet, quaver, semiquaver have been retained until the present day) and the old mensural names gradually disappeared. But new time signatures gradually appeared, indicating simply the number of beats contained in a bar. The $\frac{3}{2}$ time with its twofold meaning, that of the old *proportio sesquialtera*, and the new one of three minims to a bar, may perhaps have formed the bridge; the $\frac{6}{4}$ time also, next came into use as *proportio*, inasmuch as 6 semiminims were to have the customary value of 4. But, in 1700, $\frac{3}{4}$ time was added entirely with the new signification. Augmentation and diminution were rendered superfluous by the new *tempo* signs adagio, allegro, andante, introduced from Italy about 1600, which were now soon multiplied by numerous suffixes as well as by diminutive and augmentative forms which have been retained up to the present time.

End of the First Part.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